For areas of Soil Types of Sullivan County, see map page 246.
For descriptions of these types, see Knox, Clay and Vigo Counties.

Soil Survey of Clay, Knox, Sullivan and Vigo Counties, Indiana.

By Chas. W. Shannon.

The four counties included in this survey are situated in the southwestern part of the State, and occupy an area of 1,709 square miles. All the counties to the south and east of this area have been worked by the Soil Survey, and the reports have been published, with the exception of Owen County, which was covered during the past season, and the report of the field work is published in another part of the present Annual Report. The Wabash River forms the western boundary of the area, with the exception of the northern part of the west line of Vigo. The counties on the north have not been surveyed.

PHYSIOGRAPHY AND GEOLOGY.

The area under consideration, in a general way, has for its northern boundary the southern line of the Wisconsin drift. The entire area is within the limits of the Illinois glacier, and most of the surface has received a deposit more or less of the loess-like material derived from the Iowan drift, and the extreme northern part has been influenced to some extent by the outwash from the Wisconsin. In many places the underlying geological formations have been the source of much of the soil making material. On the slopes, the hillsides and the cuts of the streams, the drift has been carried away and the soil is a true residual type. The surface formation of the area consists of some small areas of the Upper Mississippian (the Huron) and a considerable continuous strip of Mansfield sandstone (Millstone grit or basal member of the coal measure) along the eastern side of Clay County; the coal measure proper covers the whole of the remaining part of the area, with the exception of a narrow outcrop of Merom sandstone, along the bluffs of the Wabash in Sullivan and Knox counties.

There are no very rugged surface features over the area with the exception of the immediate stream bluffs. In general the surface is level and gently undulating. Rock exposures are numerous

throughout the counties. The surface is in most places covered with a coating of drift material varying in thickness from a few inches to several feet. It has been estimated that in order to accomplish the work done by the ice sheets and to form the great thickness of drift material that the ice must have covered the region about Terre Haute to the depth of at least five or six hundred feet.

The Illinoian Drift.

The State was invaded by ice which had its center of dispersion in the elevated districts to the east and south of the Hudson Bay. From the region to the north of Lake Huron there was a movement to the west of south over the Lake Michigan Basin, Illinois and western Indiana. From a part of this sheet, the part known as the Illinoian lobe was formed. The deposit left by this invasion constitutes the surface (aside from the thin covering of loess) over the entire of southwestern Indiana and an area of almost equal size in the southeastren part—that is, it covers the entire area between the glacial boundary and the line of the Wisconsin drift. Many wells and drillings have shown that this drift is present also farther to the north underlying the Wisconsin. The thickness of this drift over the area of its exposure is in general about twenty-five feet deep except in filled valleys. In places, the ridges carry but a thin coating, while adjoining valleys may be filled one hundred feet or more. At the southern limit the coating of material is very thin in most places and while the boundary is not marked by a well defined ridge, the character of the soil and the natural vegetation mark approximately the limits of the drift.

In general, the material is of a yellowish brown color to a depth of 15 feet or more, beneath which the color is a gray or blue gray. There is every transition from the brown to the gray; it is therefore probable that the brown is an altered gray till, the oxidation of the iron having produced the color. In the filled valleys sand and gravel are often found and in the northern part of the area the drift becomes more variable. The underlying rock formations in most of the area appear to have contributed largely to the material of the till. Where the underlying rocks are of a friable nature the material has been reduced to sand or pebbly constituents. The till thus varies with the character of the underlying rocks. The locally formed pebbles and rock fragments are chiefly sandstone, but numerous foreign rocks and bowlders of large size

are occasionally found near the limit of the drift. The region presents a fairly even topography. In places, knolls and ridges with undulating surfaces occur, but in no place do they become of great height.

Striæ are found in several places. They occur in Sullivan, Vigo, Clay, Greene, and Owen counties. The markings are chiefly upon sandstone exposures. In Clay County, on the northwest side of Eel River, on the James Campbell farm, there are very conspicuous glacial scorings on the surface of Mansfield sandstone exposures. Here a bare exposure of considerable extent in the head of the ravine has had the stone surface polished very smooth and finely grooved by the action of the ice-sheet. A part of this exposure has been blasted away for the purpose of securing stone for railroad ballast and road material, and on the remaining part the scorings have been somewhat obliterated because the surface was formerly used for a feeding ground. The markings are, however, very indistinct. In the pictures taken of this exposure some were taken just as the surface appears; in others the grooves were strewn with white sand in order to give more contrast in the photographs. Some of the photographs are included in this report. This exposure should be preserved. One mile east of Bowling Green, at the fork of the roads, is another exposure of sandstone with a flat surface upon which glacial striæ have been noted. At the present time the washed material from the higher ground has covered a large part of the exposure and on the part projecting into the roadway the lines have become very obscure, from the wheels of vehicles, etc.

The drainage of the area covered by the Illinoian invasion was in many respects greatly modified. In attempting to work out the history of an area whose drainage has been arrested by the invasion of an ice-sheet, the life resolves itself into four fundamental parts. First, what were the topographic characteristics of the area during the pre-glacial history. Second, what changes took place during the glacial history. Third, what has happened since the disappearance of the ice-sheet; its post-glacial history. Fourth, what was the effect produced on the unglaciated parts of this area. The drainage is discussed to some extent under the description of the rivers.

The Loess of the Iowan Drift.—Prior to the invasion by the Illinoian ice lobe there was a marked interval of deglaciation and a similar interval occurred at the close of the Illinoian period. These intervals were marked by leaching and oxidation of the drift, the

accumulation of peat and soil, and the processes of erosion. The interglacial interval following the Illinoian invasion is known as the Sangamon Stage.

The surface of the Illinoian drift out side of the limits of the Wisconsin drift is covered with a fine grained, yellowish silt or loam, to which the term loess has been applied. Loess is a deposit which, like sand or gravel, may be laid down whenever conditions are favorable, but since the great bulk appears to have been deposited at a definite stage in the glacial period, the time of deposition may be referred to as the Loess Stage. This loess may be of different ages, but since the materials contained are such as occur in glacial drift it must have been derived from the drift. The source is supposed to be from the Iowan drift and the distribution due to the combined action of wind and water. The loess of Indiana varies from a fine silt of a loose, floury texture to compact masses held firmly by a calcareous cement. In some places small pebbles are found imbedded; also fossil remains of fresh water mollusks, and some insects and bones of mammals are found. The color varies from yellow to almost white, due probably to modified forms of the same material. The thickness varied from a thin coating to 25 feet or more. Where exposures of the loess material occur, the faces are vertical and compact, and any markings upon the face remain well preserved indefinitely. (See photograph of exposures along Wabash River north of Old Fort Knox, Knox County.) How far the material from the Iowan drift extends under the Wisconsin is not known.

Wisconsin Stage.—The ice-sheet of the Wisconsin Stage did not extend into this area except on the very northern boundary of Vigo County, and there are therefore no deposits of this stage covering the general surface of the region. Every stream, however, which led either directly outward from the ice margin, or received water from the tributaries which headed at the ice front carried large amounts of material from the glacier and deposited it to the south of the ice margin.

Across the northwest corner of Vigo County are accumulations of drift material which belong to the terminal moraine of the Wisconsin sheet. The surface material consists of intermingled beds of clay, sand and gravel. This area is more fully discussed under the soils of Vigo County.

The Recent Deposits.—The recent deposits of the area include those which have been deposited since the disappearance of the last ice-sheet. The time has been relatively short and a great amount of

work has not been accomplished. The work done has been chiefly a reworking of the surface material, brought about by the action of surface and stream water. Loess, drift and residual have been carried down the slopes and thoroughly mixed. Many of the streams are still cutting in the glacial filling, and in many cases the cutting has not extended sufficiently deep to produce channels to accommodate the waters at the time of excessive floods, and the second bottoms are still overflowed at times and more or less of the fine silty material is spread over the surface, giving a new supply of fertile soil.

Small areas of swamp deposits occur within the area. These deposits consist of silt, muck and vegetable remains, and are found in the broad, shallow depressions in both the lower and upper flood plains, and in the areas of ponds which have become filled, to such an extent that they retain water only in the wet seasons. Artificial drainage is placing all of these areas in a condition for cultivation. Swamps of considerable size are found in the southwest part of the area about the cypress ponds, near the junction of the White and Wabash rivers. It will be only a few years until these ponds will all have been drained, and the last of the cypress growth will be destroyed. Most of the cypress has been cut out, but enough remains to say that the cypress is a native of this part of the State, and to give the swamp something of a southern aspect.

Abandoned stream channels of all stages exist from freshly cut bayous to channels almost filled. The filling of the channels is at first rapid, because of their connection with and close proximity to the rivers. According to a report in the Patoka Folio of the United States Geological Survey, filling of silt amounting to 6 inches in a season have been recorded. In addition, large quantities of drift wood are frequently washed in, and fallen trees add their remains to the accumulation. In the latter part of the filling the deposition is less rapid and consists mainly of silt and vegetable matter, being very much like the swamp deposits except in the shape of the area.

DRAINAGE.

The principal streams are the Wabash, White and Eel rivers, Busseron Creek, Turman's Creek, Sugar Creek, and Croy's Creek. These streams and their tributaries give a large acreage of alluvial soils, which are chiefly of fertile types, and capable of being well drained. The alluvial soils have been derived in part from the glacial drift, and in part from the formations through which

the streams have cut their way. The principal streams afford a good water supply for all purposes and offer opportunities for good water power sites along their courses, and the Wabash and White rivers may be made navigable for many miles. The various streams are discussed under the counties through which they flow.

GENERAL.

The counties included in this area are of special importance from several standpoints. In addition to the many soil types of great fertility, these counties rank among the first in the production of coal, and the manufacture of clay products. The transportation facilities are good. There are good railroad lines, and each county has at least one interurban line, with others soon to be built, and the public roads are in general well improved. The Wabash River is navigable to some degree for small boats, and these are made use of locally for various purposes.

The cities of Terre Haute and Vincennes are important manufacturing and commercial centers. Brazil ranks third in population and industries. The next in order of their size are Sullivan, West Terre Haute, Bicknell and Shelburn, with several following close, but none with a population of two thousand.

The total population of the four counties is 192,000, giving an average for the entire area of 108 persons per square mile. Counting out the total city and town population, which is about 114,950, the rural population is 45 per square mile. The total farm area is about 1,024,000 acres, of which 835,150 acres are improved. Sullivan County has the highest percentage of improved land. The improved land sells at a price ranging from $50 to $200. Much of the land not so well improved is valued at $20 to $35 per acre.

CLIMATE.

The climate of the area presents no marked extremes in either temperature or precipitation. The conditions run about the same from year to year. The winters in general are not severe, nor is there excessive heat in the summer. The present winter has had the lowest temperature and also the greatest range in temperature of any for a number of years. There are many hot days in summer, but there is usually sufficient air movement to prevent an oppressive effect. The snowfall is light and does not remain on the ground for any length of time. The ground seldom remains frozen

more than a few weeks at a time and a February thaw is always expected. The average growing season is between five and six months.

The climatic conditions as shown by the records at Princeton, Gibson County, will be of importance to the southern part of the area of this Survey. The record was furnished by Elisha Jones, who has acted as signal service reporter for twenty-eight years.

The coldest weather recorded at Princeton was on January 5, 1884, with 24° below zero. The highest temperature recorded was 120°. The greatest amount of snowfall in one year was five feet, seven inches during the winter of 1880-81.

The Patoka Hills north of Princeton, with an average elevation of about 640 feet, are well supplied with fruit trees, and they seldom fail to produce a crop because of weather conditions. The average time for the first wheat cutting in the county for twenty-six years was June 14th, and the earliest was June 2d. In the summer of 1910, it was June 20th. The greatest yearly rainfall in twenty-six years was 58 inches, the least yearly rainfall was 27 inches, and the greatest amount of rainfall reported for twenty-four hours was 10½ inches.

It will be noted from the following table that the average temperature for December, 1909, was much lower than for December, 1908.

	December, 1908.	December, 1909.	Year 1908.	Year 1909.
Highest temperature	67°	62°	98°	102°
Lowest temperature	14°	–4°	50°	–4°
Average temperature	35°	26°	56°	58°
Rainfall and melted snow	1.5″	3.7″	40.5″	39.5″
Snowfall	2″	6″	14″	.....

December, 1909, was the coldest December. The first snow was on the 7th. The first snow to cover the ground in 1908 was Christmas eve. December, 1911, was much colder than the same month for 1909, but the record is not reported.

The following table from the Weather Bureau records at Worthington, Greene County, which is just to the south of Clay County and just east of Sullivan, shows the temperature and rainfall and the dates of killing frosts:

Normal Monthly and Annual Temperature and Precipitation.

Month.	Temperature. °F.	Precipitation. Inches.
January	....	....
February	31.6	3.61
March	41.2	3.76
April	54.3	3.52
May	62.8	3.78
June	72.4	4.58
July	75.2	3.55
August	73.3	3.68
September	66.6	3.14
October	55.3	2.59
November	42.2	4.15
December	33.0	3.07

Dates of First and Last Killing Frost.

Year.	Last in Spring.	First in Fall.
1897	Apr. 10	Sept. 21
1898	Apr. 7	Oct. 15
1899	Apr. 16	Sept. 27
1900	May 10	Oct. 18
1901	Apr. 21	Sept. 18
1902	Apr. 15	Sept. 14
1903	May 4	Sept. 17
1904	Apr. 21	Oct. 23
1905	.....	.....
1906	.....	Oct. 28
1907	Apr. 21	Nov. 3
1908	May 1	Oct. 3
1909	May 11	Oct. 12
1910	May 14	Oct. 23
1911	May 3	Oct. 24

The frost record at Worthington is not a correct indication of the range of temperature for the entire area surrounding. The station is located in an angle of the river valley where the air circulation is poor. A record for the adjacent uplands would probably show a somewhat longer growing period for fruits and vegetables.

CLAY COUNTY.

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

Clay County was named in honor of the statesman, Henry Clay, but the name proved to be very oppropriate because of the inexhaustible supply of clay and shale, which has placed the county first in the manufacture of clay products.

The county was organized in 1825, and contains 357 square miles. It is 30 miles long from north to south and from 10 to 16 miles wide. The general elevation ranges between 550 feet to 675 feet above tide. In 1817, Sullivan County was organized out of Knox and included all territory now contained within Vigo and Clay counties and parts of Greene and Owen. When Vigo and Owen were organized in 1818, the former included 132 square miles of the area afterward formed into Clay County. The county is divided into eleven townships: Lewis, Harrison, Perry, Sugar Ridge, Washington, Posey, Jackson, Cass, Van Buren, Dick Johnson and Brazil.

The greater part of the county in its primitive condition was heavily timbered. The earliest settlements in the county were necessarily made on the higher lands, chiefly on the bluffs and knolls along Eel River and other streams. In the early days, the lowlands and flats were too wet for cultivation, and not safe places for the settlements to be made. To David Thomas belongs the honor of having made the original settlement on the bluffs of Eel River, in the autumn of 1818, on what is now the James M. Campbell farm. In 1819, Samuel Rizley came from Knox County and settled at the same location, where on February 13, 1820, Eliza Rizley was born, the first white child born within the limits of the county. Many names among the pioneers might be mentioned with interest, but further concerning the historical retrospection must here be passed by. However, the pioneers of Clay County will not be forgotten. Their labors have been crowned with success, even more than could have been anticipated.

Brazil, the county seat, was founded in 1844, by Owen Thorpe, who had moved a house from the site of the original Harmony, to a point along the National Road three miles farther west. Thorpe was the first postmaster and named the town for Brazil, South America, which was at that time attracting the attention of the world, because of its action in certain insurrectionary move-

ments. The growth of the town from 1845-50 was very slow in population, the government census showing for 1850 a total of 84 persons, and an historical account of that date mentions Brazil as "a small village in Clay County, on the National Road, 16 miles east of Terre Haute." But with the coming of the Vandalia Railroad, and the discovery and development of block coal, the town began to grow rapidly, and in 1857 the town showed a population of 393. In 1873, there was a population of 3,000, and at the present time there is a population of 10,000.

The conditions are very favorable for a great future growth of the city. There are six steam railroads with twenty-four passenger trains daily; one interurban line, with hourly service east and west; more than ten miles of brick street; fifty miles of stone and cement walks; municipal water works with fifteen miles of mains; fifteen miles of sewer; fifty factories and mills which together with the mines employ 2,000 men and 50 women, with a weekly payroll of $40,000. There are seven public schools, a parochial school, and about sixty teachers are employed. There are twelve churches, five banks, and three building and loan associations. Among the industries may be mentioned six bakeries, nine brick and tile mills, three carriage and wagon factories, two cigar factories, four lumber yards, flour and grist mills, five machine shops, overalls factory, fence factory and piano factory.

In addition to the above factories, two others built during the past year are of great importance—a concern of large capacity for the manufacture of tin cans and containers, located in the northwest part of the city, and a foods product plant situated near the piano factory on the east side of the city. The factory is for the canning of tomatoes, corn, and other products, the making of catsup, and various other products. The establishment of such factories should be a great benefit to the city and the surrounding country. Hundreds of acres which have been yielding but small returns can be made to produce excellent yields of special crops.

The Commercial Club has brought much new business into the city and county during the past few years and now offers free sites and financial aid to manufacturing industries desiring to locate in this region. The availability of good steam coal at a low price makes the location attractive.

The clay industries located about the city, none more than two miles distant, give employment to 1,100 men. A population of at least 5,000 thus gains its support from this industry. Adding to

this those who are engaged in the mining business, the dependence of the town upon the natural resources is readily seen. The output of the factories, clay plants and mines are marketed in every State of the Union, but chiefly within a radius of 200 miles. The great development of business has come about in less than twenty years. Prior to that time, with the exception of the Weaver Clay Company, the trade was only local and in comparison with the coal business was insignificant.

The city has now an excellent water supply from a series of eight or ten deep wells. Various tests and chemical analyses of the water have shown it good. A striking test of the adequacy of the supply was furnished in the summers of 1908 and 1911, when many cities suffered water famines. In Brazil the supply showed no signs of failing and no restrictions were placed upon the liberal use of the water for all purposes. Many private wells also furnished abundant supplies for various uses, and are used to a considerable degree for drinking water, but from a sanitary standpoint the water from the city supply is much safer to use.

A number of substantial and modern buildings have been erected within the past few years, both in the business and residence districts. The city has an assessed valuation of about $4,000,000. A splendid federal building is now being constructed, which will add greatly to the city's advancement.

Much dissatisfaction over the county over the location of the county seat (at Bowling Green) caused hard feelings, and on January 25, 1879, after a new court house had been erected at Brazil the records were removed by wagons to the new court house, which building has served until the present year. An attractive new edifice is now being built on the same site.

Knightsville, with a population of 1,080, is two miles east of Brazil, just to the south of the National Road. The Vandalia Railroad passes through the town, and a station on the Terre Haute, Indianapolis and Eastern interurban line is situated about a half mile to the north of the town. There are two schools employing five teachers; about twenty-five stores, including all classes, and the amount of business transacted is good for the size of the town and its nearness to a larger center. About 400 of the residents are employed in mines and factories outside of the town.

Harmony, with a population of 1,500, is on the National Road, three miles east of Brazil. The original town plot was laid out in 1839, but this was afterward vacated. About 1864 a new plot was laid out by Isaac Marks. The early growth and development

was due largely to location of the Planet Iron Furnace, about a mile northeast of the town. This furnace gave employment to 50 or 60 men, but was in operation only five or six years.

The Vandalia Railroad and the interurban line both pass through the town. There are several stores, some of which are well stocked and carry on a considerable amount of business. It is a good residence town, and is well situated to grow as such. It is the largest unincorporated town in the county, and is said to be the largest town of the name in the United States.

Carbon, with a population of 493, is located six miles north of Brazil and is on the main east and west line of the Big Four Railroad and on the Midland line which comes in from Brazil on the south and gives connection with several points to the north and east. The Big Four line is double tracked from Indianapolis to Terre Haute, and has a heavy traffic on both freight and passenger service. The Midland is an old line doing freight business, with some mixed trains for passenger service.

There are about fifteen stores, one lumber yard, one public school, three churches, one state bank, one brick and tile mill, and one clay plant with a capacity sufficient to give employment to 150 to 200 men, but the plant is not in operation. The town owes its origin to the mining industry, but the mines in the immediate vicinity have been pretty well worked out. The town was founded in 1870 by the Carbon Block Coal Company. The surface of the surrounding country is fairly well improved and the soils will admit of successful cultivation. The best agricultural possibilities have not been reached, but there is a great opportunity for development, and the town would furnish an excellent location for grain mills, canning factories and similar industries.

Cardonia is a little village situated about half way between Carbon and Brazil. It has a population of about 200.

Benwood, one mile east of Cardonia, exists now only in name. In former years a little village sprang up when the mines in that region were in operation.

Marysville is the name applied to the part of the town of Lena lying on the south side of the railroad. The stores and the post-office are in Parke County. The railroad station is on the county line. The population is about 200. It is four miles east of Carbon.

Perth, with a population of 250, is a mining town on the Big Four Railroad, three miles west of Carbon. There are a few stores, a good public school, and a new railway station. The dwelling houses as a rule are not substantially built.

Prattsville, or Lodi, in Dick Johnson Township, is now nothing more than a place name.

Staunton, four miles southwest of Brazil, has a population of 750. The past few years have made some changes in the town. Several new buildings have been erected and during the past year a new school building was built, and a three years high school is maintained. The town is on the old line of the Vandalia Railroad, and is a little more than a mile south of Staunton stop on the interurban line. There are now no factories in Staunton, but there are chances for development in the various raw materials of the surrounding country.

Cloverland is a small village of about 200 people, six miles west of Brazil on the National Road and the interurban line. There is one general store, a postoffice and a number of good residences.

Turner, or Newberg, is a little village on the old line of the Vandalia, about midway between Brazil and Staunton.

Cory is a small town of 300 people in the southwestern part of the county on the line of the Evansville and Terre Haute Railroad. The principal industries are a sawmill and a lumber yard, a flour mill and a broom factory. The town is surrounded by an excellent farming region, and is an important marketing and trading center for the surrounding country.

Coalmont, in the southwest corner of the county, was founded by John R. Walsh in 1900, and was so named after its location in the coal belt and in an area of higher elevation than the surrounding points. The town now has a population of 650; several good mines are near and it is probable that the town will continue to grow.

Howesville is a small village in the extreme southern part of the county, seven miles southwest of Clay City. It is on the new line of the Monon and is well situated to make a good growth.

Clay City is in Harrison Township, eighteen miles south of Brazil. It is the principal town of the southern part of the county. It was first known as "Markland" or "The Y," but when the postoffice was established was named Clay City. It owes its origin to the fact that a twenty-six mile line of railroad built out from Terre Haute had its terminus at this point instead of extending to the old town of Middlebury. The town was founded in 1873. It is on the E. & I. Railroad and the new line of the C., I. & L. Five rural mail routes go out from the town. The chief industries are two grain elevators and feed mills, lumber yards, machine shops, sawmill, two tinshops, a canning factory, a pottery, two brick

and tile plants, the largest of which is not in operation at present. An attempt has been made during the past season to secure a creamery here, and it is reasonably sure that it will be established. There are about twenty-five stores of various kinds. A large new school building was erected during the past year. The town is in good condition for a substantial growth if enterprises can be secured to make use of the materials at hand.

Middlebury, about a mile south of Clay City, is one of the early towns of the county. It is situated on an elevated tract of land, about one hundred feet higher than the town of Clay City. The town has a population of about 350.

Saline City, six miles north of Clay City, is located at the junction point of the main line of the E. & I. Railroad with the Brazil Branch. The town was laid out in 1872. It marks the site of encampment of two companies of Indiana militia sent out to protect the canal property at the time the canal reservoir of Birch Creek was being constructed. (See account of Reservoir War in another part of this report.) There are several stores, two or three of which are very good general stores. The town affords a good trading center for the surrounding country. Many excellent farms are found in the region.

Just on the south side of Eel River, about midway between Clay City and Saline City, is the station known as the Eel River Station. There is only a switch, a scale house, a stock pen and a small store. The station is, however, of great importance to a large area of the adjoining county. All grains and other farm products are bought, weighed and loaded on cars for shipment. Grain companies and stock buyers buy the products and do the shipping for themselves. It is proposed to build a grain elevator here before another shipping season. A noted camping place is nearby on the banks of the river. The fertile, rich bottoms give high yields of corn and the adjoining uplands are especially adapted for wheat.

Ashboro, a little village and postoffice, is on the Brazil Branch of the E. & I., ten miles south of Brazil. The town was named from Ashboro, North Carolina, and not from the location of certain ash trees as the name might indicate, and as is the general impression. The population is about 300. The town is located about the center of the county. Two or three good general stores furnish supplies for the vicinity. A sawmill is practically the only other industry. Many of the residences about the edge of the town are on farms of considerable size and great fertility. Some good timber is still found in the vicinity. Just to the south edge of the

town is the fruit farm of Isaac Sharp. Much of the fruit raised is shipped to Brazil and other points.

Center Point is located in the central part of the county, eleven miles southeast of Brazil, on a branch of the Vandalia Railroad. It has a population of about 425. Four rural routes go out of the town. The principal industries are brick and tile factory, flour and grist mill, a sawmill and a canning factory. It is a good residence town and is well situated to furnish desirable home locations.

Asherville, a small village, is situated on the Center Point Division of the Vandalia, six miles southeast of Brazil. It affords a good trading center for the surrounding country.

Stearleyville, now a place name only, was formerly a postoffice. Whittington, four miles southeast of Brazil, was also a postoffice location. Pontiac and Bee Ridge are only locality names. Eagles is a stop name along the interurban line east of Harmony.

Prairie City is a town plot and station on the E. & I. Railroad, six miles south of Brazil, has a population of only 64 people. It was named from its location in the Wheeler or Clay Prairie.

Bowling Green, the oldest town within the county, was laid out in 1825. It was the first county seat of Clay County and held this distinction until 1879. The first court house and jail were built in 1827 of hewn logs. A second court house was erected but was burned in 1851; another was built and first occupied in 1853. This building was destroyed by fire in 1910. The county seat has been located at Brazil since 1879. Bowling Green has a public school employing three teachers, three churches, a flour and grist mill, a furniture factory and a sawmill.

There is no railroad through the town. A few years ago a line was in the course of construction, passing near the town, but failed of completion after much work had been done. The nearest railroad accommodation is Center Point. A hack line operates between the two towns.

Poland, the only town in Cass Township, is six miles north of Bowling Green and a half mile from the Owen County line. It is located in a good agricultural region. This part of the county was settled chiefly by Germans, and their thrift has shown upon the development and improvement of the farms. A large German church is situated one mile south of the town.

General.

The growth of the county may be readily seen from the following concerning the population and industries: The popula-

tion in 1836 was 1,616; in 1840, 5,567; in 1850, 7,000; and in 1910, 32,535. An old historical report of 1850 gives the following information: "There are seven stores, four lawyers, twelve physicians, twelve preachers, four grist and sawmills and the usual proportion of the different mechanical trades. The surplus articles for exportation are wheat, hogs, cattle and horses." The total farm area is 212,036 acres, of which 165,553 acres are improved. The value of the total taxable property of the county is $14,866,000, of which the farm land and improvements amount to $6,267,675. Land sells on the average for about $50 per acre for farming purposes, but commands much higher prices when underlain with coal deposits. The price for the best of the land is from $300 to $500 per acre.

The chief crops grown in the county are wheat, corn, oats, and rye. The county produces annually about 800,000 bushels of corn, an average of about 25 bushels per acre; wheat 245,000 bushels with an average yield of 12 to 15 bushels, with an occasional yield of 30 to 40 bushels per acre; oats 226,700 bushels, ranging in yield from 10 to 25 bushels per acre; some small patches of buckwheat are grown and produce on the average of 10 bushels per acre; about 100 acres of rye are grown annually and give a yield of about 10 bushels per acre; timothy about 36,000 tons, a yield of from one to 1½ tons per acre. The county ranks among the ten leading counties in the State both in acreage and production of timothy hay; about 5,000 acres of clover are grown, giving a yield of about a ton and a quarter per acre. Some seed is hulled, but the production is very low; the average yield for the county is about 700 bushels, which is less than one bushel per acre for the amount thrashed. Alfalfa, about 50 acres, yielding on the average about three or four tons per acre, with some exceptional yields of six and eight tons per acre, when the soils were limed and the best care taken in the harvesting.

From 450 to 500 acres of potatoes are grown and yield from 50 to 60 bushels per acre. Tomato growing promises to become of considerable importance. A large acreage was planted during the past season, but it is difficult to estimate the yield for a good season since the season of 1911 was so very dry that the crop could not mature. For a few years past, about 250 acres have been grown and yielded from two to three tons per acre.

Peas grow well, and an increasing acreage is being grown each year; about 460 bushels of onions are grown, giving about 75 bushels per acre. All small fruits are grown to some extent. About

8,000 bushels of berries of various kinds are grown annually, giving a yield of about 125 bushels per acre. Small areas about Brazil, Cloverland, Ashboro and Clay City are devoted to truck farming and the growing of small fruit. The soils are well adapted to this purpose, but so far the interest taken in the production of such crops has not produced yields by any means sufficient to supply the county's demands.

Clay County has not reached its highest development.

Coal mining has been the principal industry of the county. At present the county does not stand at the head of the list in the production of any of the farm products, and in some of the grain crops it ranks but seventieth among the 92 counties. Some Indiana soil has produced 150 bushels of corn per acre; some in Clay County has produced 80 to 100 bushels, but the average crop is only 25 bushels. There is great opportunity for growth and development along this line.

Dairying offers to be a paying enterprise in this county. In the north central part of the county a considerable number of cattle are kept which furnish milk supplies for Brazil and Terre Haute. An attempt is being made at present to establish a creamery at Clay City. The locality is a very favorable one for this industry.

The land about Clay City is specially adapted for cattle raising and dairying. There are at present very few farmers in the locality who keep more than two or three cows, a few have six to eight, and a number have one or none. One of the principal needs in the keeping of cows is a good supply of summer feed. All about Clay City and chiefly to the east and south are hundreds of acres of land which are practically without use, and could readily be made to yield good returns as pasture land.

The yield of the grain crops per acre is low on the majority of the farms, and the chief reason is that the soils have been depleted by continual cropping.

All produce raised is marketed from the farms and all organic matter and available plant foods are destroyed. If enough cows were kept on each farm to eat the crops produced, the material taken from the soil would be restored through the manure.

In times when a large amount of humus was being restored to the soil through the application of barnyard manure, there was no need for commercial fertilizers, but grain crops began to fail in their production. The cause of this diminution of course was the incompleteness of the returns of the soil ingredients taken off by

the crops, when they were exported to the cities or other regions. Such a condition led to the discovery of mineral fertilizer. The only possible substitute for stable manure is found in green manuring with leguminous plants conjointly with the use of mineral fertilizers. If such crops are grown on the farms to keep up the soils, a double value may thus be secured by pasturing and feeding cattle on the crops. The use of commercial fertilizers alone leads to the depletion of humus substances which renders the proper tilth of the seed bed impossible and causes a compacting of the surface soil which no tillage can remedy. While manure is valuable because of the chemical composition it is well understood that its efficiency is largely due to the important physical effects it produces in the soils. The manure also acts readily upon the bacterial activity of the soil. It renders the soil ingredients more available and imparts to the soil the loose condition required in a good seed bed.

The establishment of a creamery in Clay City will be one of the best things which could be done to assist in the proper agricultural development of the surrounding country and bring about the fertilization of all the land.

Transportation facilities.—In general, the railway facilities of the county are good. Some parts of the county are, however, somewhat handicapped by lack of railway transportation. The C., C., C. & St. L., or Big Four, Railroad crosses the northern part of the county, with a double track line; the Pennsylvania Road (the Vandalia) crosses from east to west through Brazil, is also double tracked. These lines run almost straight east to west across the county. The Vandalia has branch lines, the old line passing to the southwest from Brazil through Turner, Staunton, and back to Terre Haute. The Center Point Branch from the main line extends south to Asherville and Center Point. Several other branches and switches lead out to the various mines and clay plants. The Central Indiana (Midland) now operated by the Big Four and Pennsylvania Lines, extends from Brazil north through Carbon and connects with points north and east.

The C., E. & I. runs north from Brazil and extends through the northwest part of the county. This road joins the main division at Momence, Illinois. A main branch of the E. & I. or E. & T. H. extends from Terre Haute through the southwest part of the county, passing through Cory to Saline City, where it forms the junction with the Brazil branch, and extending south through Clay City, then turning to the south and east to Worthington and

then in a southwestern direction through Washington to Evansville. The C., I. & L. (Monon) comes into Clay City from the east and turns south through Howesville into the Linton coal field; this division connects with the main line at Wallace Junction. The Southern Indiana extends across the southwest corner of the county, through Coalmont, with a branch extending off to the southwest into Sullivan County. The Indianapolis division of the line as planned was partly constructed from Black Hawk, Vigo County, to Eel River near Bowling Green in 1904-05, but operations ceased and have never been renewed. The T. H., I. & E. traction line extends across the county almost paralleling the Vandalia Railroad. It gives hourly service between Indianapolis and Terre Haute, with additional cars between Terre Haute and Brazil. The railroads give good connection with Indianapolis, St. Louis, Evansville, Chicago and many other good commercial centers. A north and south interurban line through the county would be a great benefit; such a line would encourage dairying, truck-farming and fruit growing.

The county has 800 miles of public roads, with 250 miles improved, of which 160 miles are improved with crushed stone and about 50 miles with broken stone with a top dressing of gravel and the remainder with gravel alone. The roads are, as a rule, in good condition, and the farmers are well satisfied with their investments in improved roads. Some parts of the county are abundantly supplied with good road material, while other parts have no available road metal.

Agricultural Societies.—The farmers of the county attempted to organize an agricultural society as early as 1853. In the "Eel River Proceeding" of August 27th, the first issue of the paper, the following editorial appeared concerning the organization of such a society: "There is considerable talk among the farmers of the county at the present in regard to the organization of an agricultural society. We hope they may persevere until they accomplish their object. The farmers will find it much to their advantage and should not cease working on the matter until a society is organized. They have a newspaper in the county now to attend to the publishing department, and there is no excuse for any further delay."

In the meeting which followed it was decided to hold the first fair at Bowling Green. The movement met with success and the fair was held the next year at the same place. The following year the fair was held at Center Point. The fair was held at this place for five years; then in 1862 new grounds were secured at Bowling Green, but with the public attention being absorbed by the Civil

War the fair was abandoned for several years. In 1869, the county was in a joint organization with Owen, Monroe, Morgan, Greene, Putnam, Lawrence and Hendricks counties and the fair was held at Gosport. Township fairs were held at various times and places during the years 1857-1860.

In 1878 the Clay County Fair Association was organized. In 1882 the "Clay City Industrial Fair" held a three days' exhibition near Clay City. Following this the "Harrison Township Agricultural Society" was formed. This organization was established at Brazil, but the organization passed out of existence a number of years ago and the grounds have been plotted in city lots.

A farmers' institute has been maintained for the past twenty-five years and meetings are held at various places in the county. In 1908 the society was organized as the "Clay County Farmers' Institute Association." The meetings are usually well attended. Good speakers on various agricultural questions are secured for the meetings. The general discussions which take place in the meetings are of much importance. The exchange of methods among farmers themselves should be an important phase of these meetings. There are some of the best farmers, however, who do not take interest in the meetings, for the reason that they do not feel that the meetings are of any special value to them, but these are the very ones who should be encouraged to give their methods to others. Another class not much interested is the poor farmer who does not have faith in new and up-to-date methods for the reason that he has not seen the thing demonstrated and is not of a progressive nature to seek for a better plan. The institutes are therefore chiefly attended by the wide-awake, and medium well-to-do farmer.

The Boys' Corn Club has created considerable interest during the past few years. The Woman's Auxiliary was organized at Clay City in 1907.

Physiography and Geology.

Topography.—The surface is principally level or slightly undulating. The rougher portions are found along the principal streams, chiefly Otter Creek and its tributaries in the northwestern part and across the central northern; Croy's Creek in the southeast, and along the immediate border between the bottoms and uplands along Eel River. The elevations range from 550 feet to 700 feet on a few points.

Although the present surface is fairly uniform, the drill prospecting and coal mining show that the old preglacial surface has

been pretty thoroughly dissected, and if the present surface could be removed, deeply eroded channels with intervening ridges would be characteristic of the topography. These channels are of special concern to the mining industry. The amount of coal underlying a tract of land is uncertain, and much drilling and prospective investigation within the mines is necessary to determine the value of coal properties. "Some of these hidden channels have been revealed by mining operations or the drill. Thus near Carbon, Section five (13 N., 6 W.) three old channels exist, running southwest, one passing a short distance east of the Litchfield shaft, the other two, some 100 feet or so broad, crossing the property of Eureka No. 2 shaft, cutting out the upper coal. South of Carbon drillings are reported to have revealed a broad channel crossing Section 7 (13 N., 6 W.) and running south on the top of the hill west of Otter Creek, then still south to the west of Brazil, then turning and passing south to Turner, Section 11 (12 N., 7 W.) and going west into Vigo County. In like manner these old valleys have been met in all parts of the county."*

At the Leachman Gravel Pit in the southeast quarter of Section 12 (13 N., 7 W.) the deposit seems to be a preglacial channel. To the east and west, coal is found at the same level as the gravel and sand. Well drillings and mine shafts show the deposit to be at least 100 acres in extent, with a thickness of 10 to 50 feet. The pit is opened along the bed of a small stream, where the gravel is covered with only from three to five feet of soil and clay, but outside the valley the covering is from 15 to 30 feet thick.

Geological Formations.—The surface formations of the county consist of the Huron, the Mansfield and the Coal Measures.

The Huron comprises an area in the eastern part of about eight square miles along the valley of Eel River and Croy's Creek, and to the east where the Mansfield sandstone has been eroded away. The Huron formation consists of a series of shales, sandstones and thin bedded limestone. None of this formation is well enough developed to be of any economic importance in the county. The shales have contributed somewhat to the soils of the hillsides and the stream bottoms of the area.

The Mansfield sandstone is a massive, coarse to medium grained sandstone containing, usually, considerable iron. It is the surface over an area of about 50 square miles. Its greatest thickness is about 75 feet. At the base is a rather persistent layer of black,

* G. H. Ashley, Report State Geologist, 1898, p. 520.

coaly shale. The streams through this area follow very closely the outcrop of this formation and are cutting down the dip, so that in many places vertical or overhanging cliffs are produced. The finest scenery within the county is developed along the exposures of the stone. At several points it is of sufficient purity to be a source of glass sand and a number of investigations and analyses have been made for the purpose of interesting persons in the development of this industry. Near Bowling Green are some fine examples of glacial scoring upon the surface of the Mansfield. The weathering of this formation has been the source of much of the sand content of the alluvial soils of the county.

The coal measures proper consist of a series of sandstones, shales, coal, underclays and thin bedded limestones. These are the economic rock of the county. The shales, underclays and coal have been the natural resources which have developed Clay County. The limestones are good for road metal and railway ballast.

The following sections will show the nature and thickness of the soils and the various members of the geological formation.

Section at the Simpson Mine and Clay Factory, Two Miles West of Carbon.

	Feet.	Inches.
Soil and surface clay	2	0
Yellow surface clay	4	0
Gray to yellow, shaly sandstone	17	0
Coal IV	3	10
Under clay	6	8
Blue to gray shale	28	0
Coal III	3	2
Under clay merging into sandstone	7	0
Total depth	71	8

Open Pit on the John A. Wells Farm, One-half Mile Southwest of Carbon.

	Feet.	Inches.
Soil	1	6
Yellow clay	5	0
Blue clay and sand, "Joint clay"	4	0
Blue gray shale	4	4
Coal IV	4	1
Under clay	6	2
Total depth	25	1

This pit gives an excellent view showing the contact between the different materials; the overlying soil is a typical, fine grained drift clay, free from impurities.

Section at the Shaft of the American Sewer Pipe Company.

	Feet.	Inches.
Soil, yellow clay	12	0
Bowlder clay	7	0
Gray clay shale	33	0
Coal	2	3
Under clay	3	2
Blue clay shale	19	0
Shale, dark bituminous, fossiliferous	1	6
Coal	3	6
Under clay	5	4
Total	86	9

Section at Open Pit of the Chicago Sewer Pipe Company, South of Brazil.

	Feet.	Inches.
Surface soil and clay (stripped)	1	6
Reddish yellow drift clay	8	0
Decomposed shale and reddish clay mixed.	5	0
Drab to blue clayey shale	10	0
Coal V	0	4
Under clay	5	6
Total	30	4

Section on the Wm. T. Jenkins' Farm, Three-quarters of a Mile South of Center Point.

	Feet.	Inches.
Soil and yellow clay	9	0
Gray sandy shale and sandstone	4	6
Blue clayey shale	14	6
Coal IV	3	0
Under clay	3+	0
Total	34+	0

Section of Open Pit of the Clay City Brick and Clay Company, Three-fourths Mile Southeast of Clay City.

	Feet.	Inches.
Soil and yellow surface clay	15	0
Blue clayey shale	16	0
Coal V	2	10
Under clay	8	0
Total	41	10

Drainage.—The drainage of the county belongs to two systems. The north and south forks of Otter Creek drain the northwestern part of the county and flow into the Wabash River. The rest of

the county is drained by Eel River and its tributaries. Eel River joins White River at Worthington. The angle at which the junction is formed is a great hindrance to the successful flow of the waters from the Eel River system. The waters are discharged almost directly up the channel of White River, and consequently the flow is checked, and also when high waters come down the White River the waters are backed up into the Eel River channel often causing disastrous overflows in the valley of the latter stream. An attempt will be made to straighten the channel at this point and thus aid in the drainage of the Eel River flats, both in Greene and Clay counties. An old dam at the mouth of the river is also a source of serious trouble to the outlet. This point is boosted for its water-power facilities, but the clearing away of all obstacles in order to secure better drainage of the farm lands will be of much more value than all the income to be derived from water power.

It is unfortunate that the name Eel River has been applied to two streams within the State. The river here being considered should not be confused with the Eel River which enters the Wabash at Logansport.

Eel River has a length of about 100 miles. The east fork known as Mill Creek, which rises in Hendricks County, crosses the corner of Morgan, and traverses the limestone region of Owen County, is about 40 miles in length; and the west fork, Walnut Creek, which has its source in southern central Boone County, flows across the corner of Hendricks into Putnam, where it crosses over the edge of the Wisconsin drift, is 50 miles or more in length. Below the junction of these forks, the stream has a length of about 45 miles, not including the minor windings of the channel. The distance of flow through Clay County is about 36 miles. The stream follows a very meandering course, and has a sand choked channel. The material is derived in part from the glacial drift, but largely from the heavy sandstone formations exposed along the course and especially in the tributaries. The following description of the Eel River area from the "History of Clay County" by William Travis gives a good account of the attempts to work out safeguards against flood waters, and to establish a satisfactory drainage system. The description also includes the tributaries of Eel River which flow entirely or in part within the county.

"From the point at which Eel River crosses the line into this county in Township 12 north, range 5 west, it flows in a direction west of south until it strikes the rocky bluff at Bellaire, a distance of ten miles on the straight line where it is deflected, then flows in

a direction a little south of west until it strikes the foot of Old Hill, another distance of about ten miles on the straight line, where it is again deflected, from which point it flows uninterruptedly in a southeastern direction, a distance of 13 miles to the extreme southeast corner of the county. The entire length of the stream from the source of Walnut to the mouth at Point Commerce, Greene County, including its meanderings, cannot be accurately estimated, but may be approximated at 300 miles. An air line from the source in Boone County to the confluence with White River will measure about 100 miles. Counting from the source of Mill Creek the distance is less. In its tortuous trend, it practically crosses the county twice. At a point just below Bellaire it approaches within half a mile of the Owen County line at Old Hill, within two miles of the Vigo County line, and as it flows out of the county it touches within half a mile of the Greene County line. It divides the county into two very irregular and unequal sections, two-sevenths of the territory lying on the east and five-sevenths on the west side of the stream. In other words, the area on the east is to that on the west as 1 to 2.5. In its circuit from the Rhodes Bluff to the point of its covering the Owen County line, a course of 90 miles, it forms a remarkable triangular-shaped bend presenting numerous equally remarkable horseshoe crooks all along its course. The distance direct between these two points, which are substantially on the same meridian, is but 12 miles.

"Eel River has but comparatively little fall in its course through the county and is therefore a sluggish stream. Assuming the elevation of the source of the stream in Boone County to be 950 feet above sea level and that of the mouth of the river at 533 feet, approximately the entire course of the stream at 300 miles, the fall would be 417 feet, or practically 17 inches to the mile. From the sluggishness of the stream three things are easily deducible; (1) That it affords facilities for navigation. If there be any doubt that Eel River is ranked among the navigable streams of the State in the estimation of the pioneer legislator, it may be removed by the citation of the fact that in 1829 the General Assembly passed an act empowering the board of justice for Clay County to remove obstructions from the channel of the stream as far up as Croy's Mill for purposes of navigation. (2) That its water privileges for manufacturing purposes are but meager. There have been flouring mills and sawmills operated along its course, but at times, in both the wet and dry seasons of the year the stage of the water is such as to render them inoperative. (3) That it readily

overflows and inundates the lowlands bordering upon it, which is both an advantage and a disadvantage. While it contributes to the fertility and productiveness of the soil it is detrimental to health and to the crops. The river bottom proper, which varies in width from a half mile to three miles, has been inundated frequently to a depth varying from a few inches to five or six feet. Naturally this overflow accumulates a great deal of drift which tends to the channel as the water recedes.

"For thirty years after the organization of the county, Eel River was crossed either by ford or ferry. Usually during the summer and fall months the stream could be safely forded at all main road crossings. To this there was an exception, which was the crossing of the Greencastle-Carlisle road at Brunswick on the lower course of the stream.

"The first ferry on Eel River was established by David Thomas, a very early pioneer, near Bowling Green, before the date of the organization of the county and operated with but temportary suspension for practically a half century—up to the time of the completion of the present bridge at the crossing immediately west of the town of Bowilng Green about 1870, and did a traffic far beyond that of any other ferry in the county, which was a source of profit to the proprietor. Succeeding David Thomas, this ferry was operated by his son, James P. Thomas, and family, until the time of its abandonment. A ferry was established also at the original old bridge crossing, at Bowling Green, by Elkin and Campbell, in the latter part of 1808.

"Parker's Ferry at the road crossing directly west of the town of Poland, at the former Nicholas Cromwell place, was established by William B. Parker very soon after he came to the county in 1835 and was operated at seasons of the year when the stage of water in the stream made it necessary, up to the time of the construction of the bridge crossing, a short distance up the stream in 1872.

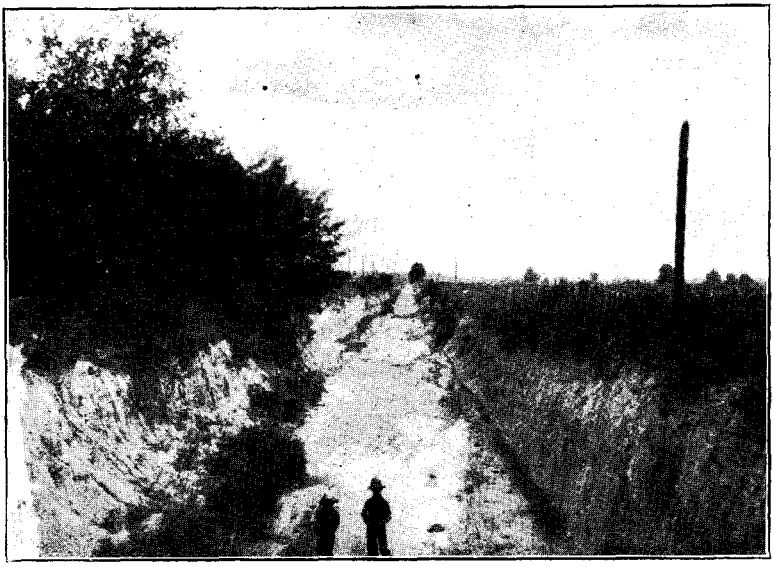
"At the Feeder Dam a ferry was operated for a number of years by William T. T. McKee, who located there in business at the time of the opening of the canal, in 1850, which was afterward conducted by Levi Huffman and still later by Jessie A. Allee up to the time of the building of the original bridge at this point, which was completed in 1879. Down the river between the dam and the Old Hill were the Harris Ferry at the mouth of Birch Creek, operated at the time of the Civil War by David Harris, and the Wilkins Ferry a mile above the mouth of Splunge Creek, con-

ducted by John Luther and later by David Lee. First below the Old Hill was the ferry at the Perry Holston place.

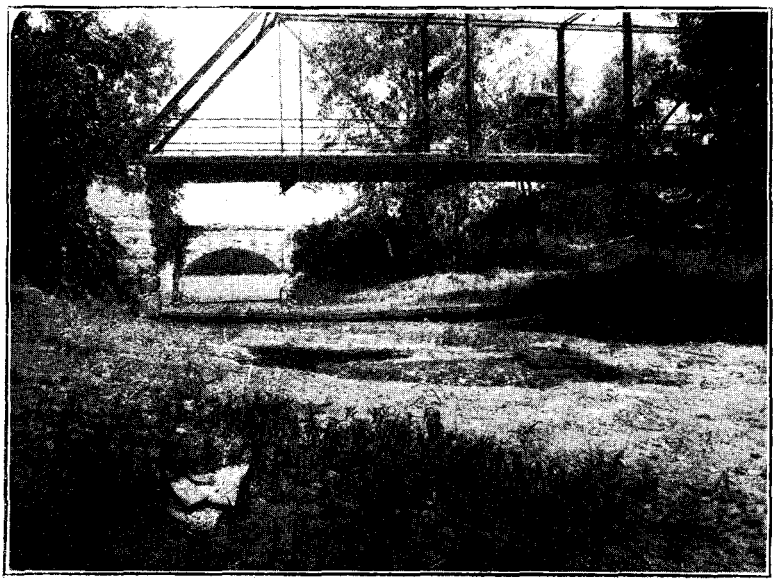
"Eel River basin, that scope of territory drained by this stream, covers an area of probably 1,000 square miles, including practically all of Clay County, with part of Owen, Putnam, Boone, Hendricks and Morgan counties. Tributary to that part of Eel River lying within the borders of this county, including its lower and middle courses, are as many as thirty smaller streams, of which the larger number are affluents from the west side. On either side are three principal branches, Jordan, Six Mile and Big Creek on the east; Croys Creek, Birch Creek, Splunge Creek on the west.

"Jordan has three distinct sources, rising in Jackson, Jennings and Morgan townships, Owen County. The main source is near Cataract. The three branches flow together one mile north of Jordan Village and a half mile east of the county line, the main stream then flowing westward into Eel River at Bowling Green. The surface drained by this stream is uneven and rugged, at places precipitous and hilly, affording sufficient current for motor purposes and the operations of mills of minimum capacity. There have been on this water course as many as four flour mills for the production of breadstuffs and feed.

"Big Creek rises at a different point in the northern and eastern parts of Harrison Township. The basin of this stream blends with that of Eel River, as do the waters of the two streams, so that the shallow confines of the creek are soon overflowed and the proportions of the stream expanded over large areas. So superficial is the bed of this stream at places that it almost loses its identity, its water diffusing promiscuously over the bottoms. However, that section of it known as "the lake," something more than a mile in extent, lying two and one-half miles northwest of Clay City, is a marked exception, of which the well defined banks, depth of channel and volume of water would seem to indicate that it might have been at some time part of a section of a much more pretentious water course. At ordinary water stage, Big Creek forces its way into Eel River through two channels. The natural one flows from the lake to the southwest, entering the river below the old "Eldorado" mill seat; the artificial one known as "the ditch," starting at a point a mile or more north of the Kossuth Road, about five and one-half miles in length, and flowing into the river a little distance above Brunswick. This channel was cut by the State in 1854 to drain the swamp lands when the channel of this stream



View of Guirl Ditch through Pucketts Prairie, Clay County.



Bridge across Splunge Creek at Old Hill. The stone wall and flood-gate up stream from the bridge were constructed to keep back the flood waters from Eel River. The creek bottom is solid sandstone at this point.

was also cleared of obstruction to what is yet known as the Cromwell Place, near the old rose patch.

"Croys Creek rises on the border of Putnam County, three miles northwest of Lena, flowing in a southwestern course across the corner of Parke County line between Lena and Calcutta, thence southeasterly through Van Buren Township, emptying into Eel River immediately above Carpenters Creek. A west side branch of this stream rises near Benwood, runs southeast and makes the junction with the main creek in the northeast corner of Jackson Township. The valley of this creek, like that of the Jordan, is very narrow, bordered at many places by short and rugged hills, the rocky bluffs approaching each other so closely as to leave but gorges for the passage of the stream.

"Birch Creek drains the central part of the county and is the largest tributory of Eel River. It has three or more distinct sources, all of which lie within the county. The east branch of this stream rises near Knightsville, the middle branch near Brazil, and the west branch at several points near Newburg. From the confluence of these three branches, near the iron bridge at the Zenor cemetery in Jackson Township, Birch Creek flows west of south into the river, just below the old aqueduct and directly opposite the former Daniel Harris place. The length of this water course is about 18 miles.

"This stream was named from the profusion of birch timber along its banks. The middle branch of it is known also as "Pogue's Run of Brazil," in allusion to Pogue's Run flowing through the city of Indianapolis, which because of the repeated annoyance and damage by overflows was improved by confining the course and flow of the stream within a walled channel. This stream is to be henceforth controlled and retained by similar improvements.

"Aside from Eel River, Birch Creek is the historic stream of the county, having contributed as a feeder to the Wabash and Erie Canal and having been also the scene of the Reservoir War, on the banks of which was encamped in June, 1855, the army of occupation.

"Splunge Creek rises in Vigo County, flowing eastward in the main across the old reservoir grounds, crossing the line into Clay County a mile or more west of the foot of the Old Hill, at which point it empties into Eel River.

"That part of the county drained by Otter Creek, including all of Dick Johnson Township and parts of Van Buren, Brazil and Posey townships, about one-tenth of the area of the county, does

not belong to the basin of Eel River, but tributory to the Wabash. The main creek rises in Jackson Township, Parke County, crosses the Dick Johnson Township line three-fourths of a mile west of the northwest corner of Van Buren and flows across the township into Vigo County. In the southwest corner of Nevins Township, Vigo County, Otter Creek proper is formed and flows thence into the Wabash.

"A quarter of a century ago, the notion prevailed on the part of many of the interested landholders, shared largely by the public, that the practical, effectual, permanent and therefore economical way of averting the overflow and inundation of the large area of the valuable lands in the big bend of the river was to change the course of the stream by cutting a channel through from Rhodes Bluff thereabout to a point below New Brunswick. With this object in view an informal survey and profile of the lands subject to overflow and sought to be reclaimed, conducted by Elias Cooprider, was made in the fore part of 1884, showing an area of 40 sections, something more than 25,000 acres, lying between Rhodes Bluff and the county line above Johnston. Upon the basis of estimate, it was shown also that there could be produced one-half million bushels of corn annually, worth approximately $200,000, on these reclaimed lands. In the month of January following, petitions were put into circulation asking the Legislature to make an appropriation of $40,000 to aid in the excavation of the proposed channel and the straightening of the stream, the cost of which was estimated at $60,000, setting forth that such improvements would reclaim lands, the taxable valuation of which would add $750,000 to the duplicate. The General Assembly, however, did not favorably consider and act upon the memorial. Without the assistance from the State by way of appropriations, the cost of such an undertaking was considered too big and was therefore practically abandoned. But at the session of the General Assembly in 1889, an act was passed providing for the incorporation of associations and the issuing of bonds of drainage, and the prevention of overflows by the cutting of ditches, construction of levees, etc. The cost of such improvements to be proportionately assessed against the land thereby benefited.

"But it was not until ten years later that any concerted action was taken by the disinterested landholders, when within the period of practically six years bonds were issued by the county aggregating more than $100,000 for such improvements. May 18, 1899, for the excavation of the Lafferty Ditch, 20 bonds of $810 each, or

$16,200, were issued; June 1, 1900, for Connelly Ditch, 73 bonds of $500, or $36,500; September 15, 1902, on account of the Lewis Township Improvement Company, 44 bonds of $500, or $22,000; May 16, 1903, for the Old Hill levee, 30 bonds of $100 each, or $3,000; October 7, 1904, for the Guirl Ditch, 40 bonds of $500 each, one of $338.11, and one for $338.16, or $2,676.27; January 16, 1900, on account of the Eel River Improvement Company, 50 bonds of $500 each, or $25,000.

"In times of protracted and heavy rainfalls, Eel River bottom has been frequently covered with floods which have swept the valley from hill to hill. The amount of damage sustained in the loss of property from this cause is dependent largely on the season, but on the aggregate it is incalculable. No season is exempt from these visitations. If the floods come in the summer time, the greatest damage is to the crops. If in winter time, to stock. There are now but few living who were here at the memorable flood of 1847, so that it is impracticable to attempt to give any account in detail of the destruction caused by it. Mention has already been made of the accumulation of drift traceable thereto and of the undermining and washing away of the Anquilla flouring mill.

"The flood, which came the middle of May, 1854, was unprecedented in the suddenness of its rising, reaching the high water mark within an incredibly short time, then receding as quickly, the like of which had never before been witnessed, from the effect of which the farmers of the flooded area did not recover that year. The freshet of July, 1866, immediately succeeding the wheat harvest, was signally destructive of the crops then standing in the shock, which were floated about and lodged promiscuously against fences, trees, and other obstacles at places in heaps by the roadsides.

"The flood tide of 1875 exceeded that of any previous or after time in the history of the county as known to civilization. Following the incessant rainfall of the last days of July, the crest of the flood on the first day of August, Sunday, rose above all known high water marks. Families living in the flooded districts who had not gone to the uplands in anticipation of the worst, who lived in two-story houses were driven to the upper floor and tenants of one-story buildings to the attic and even to the roof for safety. Relief parties in boats ministered to the wants of the imprisoned and distressed, rescuing those whose lives were in peril. Stock which had not been driven to the hills or collected upon a few knolls not covered with the waters was lost, only an occasional straggler show-

ing up after the passing of the flood. The track of the Terre Haute and Southern Railroad between the river and the bluffs of Big Creek was covered with a depth of from three to four feet, boats passing over it in the rowing back and forth. The flood rose to the level of the floor of the wagon road at Bowling Green from 15 to 18 feet above low water mark at that point. Thousands of acres of corn were destroyed. On the higher lands along the course of the stream were hundreds of people on Sunday to witness the scenes attending the swirlings of the flood.

"In the spring and summer of 1882 there were repeated freshets from heavy rains falling at intervals. Corn planting was late and after a large per cent. of the acreage had been once plowed there came another overflow which drowned out the growth, necessitating the replanting of the same acreage, which was not finished until the last days of June. Many farmers abandoned their intended planting. The harvest time of this year was exceedingly wet. Very heavy showers deluged the country, bottom and upland on the 27th and 28th of June, so that the use of machines in the grain fields had to be abandoned, as horses mired down and had to be helped out, farmers resorting to the cradle and rake in caring for the crop.

"The flood of February, 1883, did not lack much of coming up to that of August, 1875. The experience of the population of the river district was but repetitions of those of former years, intensified by low temperature and hard freezing. Schools were closed and all communication cut off from the outside territory. There was much suffering and loss of stock from drowning and being frozen up in the ice, standing in several feet of water, from which relief came only by chopping them out. The distress of the ice-bound inhabitants was relieved by aid committees from Clay City and other points. The Clay City Independent of February 9th said: 'Notwithstanding the elevation of the tracks of the Terre Haute and Southeastern Railroad across Big Creek bottom, it has been again submerged for considerable distance to the depth of one and a half or two feet. At one place the grade was completely washed out, leaving the track hang as a connection by way of suspension. We had no mail on Monday, no trains crossed until Thursday, hence we had no freight arrivals during the interval between Saturday and Thursday. Cabins in the low bottoms have been filled up to the square and some wholly inundated. In many instances, on second bottom dwellings have been filled to the windows in the lower story, the occupants being driven upstairs. Ow-

ing to the cold weather and the ice, stock has suffered greatly. The present indications are that more stock will be lost by this freshet than any one known in this section. The river is reported completely clogged with ice from the bend below the railroad bridge down to Old Hill.'

"Scarcely a year goes by without one or more such rises in Eel River. The conditions and sequences attending them from time to time, including all those of more recent years, are very much the same. At times the actual loss of property and life is comparatively meager. In cases of sickness, human suffering has been aggravated and prolonged from want of medical attention and relief and the burial of the dead delayed from the obstacles interposed. In extreme cases, the corpse and necessary train of attendants have been moved out by canoes and skiffs. Very young and helpless stock, calves, pigs, etc., have been temporarily housed and cared for in the family quarters, in kitchen or parlor until the subsidence of the water. Horses and other stock have been stifled and drowned in their stalls from the sudden rising of the flood tides by night, or in the absence of any one to release them. Small game and vermin inhabiting the bottom lands, driven from their retreats and haunts congregate on the few elevations or exposed points, especially the levees, where they may be taken with but little effort. Scores of rabbits at such times are found pacing to and fro upon the thrown up embankments of the stream, awaiting their fate at the hands of whomsoever may come along.

"As a result in effect from these frequent and sudden rises and flow of the currents there have been many changes in the banks and the corresponding location of the channels by erosion or the washing out of earth at given points, and its deposit elsewhere. In other words, the acreage of land on the immediate banks of the stream have been cut down or reduced by attrition on the one side and enlarged by corresponding accretion on the opposite side. As an example of such change wrought by time and flood, the south bank of the river at the Luther Place, at a point immediately in front of the present residence of ex-County Commissioner Jacob Luther, is now 65 rods removed and north of where it was at the time of the Government survey of lands in 1816. And just below this point, where the railroad company diverted the flow of the stream by cutting an excavation for the straightening of the channel as a precaution to the protection of the bridge, there is now an area of made land, covering the bed of the former semicircular trend of the stream and the nook about which it coursed its way,

the force of the swelling tide striking the south end of the bridge. At the angle or bend of the stream a half mile above the Rhodes Bluff at the mouth of Six Miles, a part of the ground on which stood the town of Bellaire is now swept by the flow of the stream. It may be truthfully said that grounds are now being cultivated or pastured along the course of Eel River which at a former time were so utilized on the opposite side.

"The old roadway leading around the bend of the stream east side, a little distance below the site of Feeder Dam bridge, was so repeatedly encroached upon and endangered as to force back the line of travel upon the adjoining lands, the county paying the owners of the premises in the course of years, as by the statute provided, for a considerable acreage so appropriated to the public use. As matter is indestructible and the law of compensation in Nature universally operative, this area of dirt set free by attrition at this point, to the loss of the landholders or the county, was lodged elsewhere by accretion to the gain of some one else.

"No steam craft is known to have ever plied on Eel River. However, it is said that the small boats which used to be operated on White River between Point Commerce and Spencer for light local traffic half a century ago were frequently moved up the mouth of Eel River to the mills operated there. In the extreme south part of the county, near Howesville, is a body of water known as Muir's Lake, which is believed to be a section of the old river bed, Eel River having at some time changed its channel and flowed through this part of the bottom or valley. Other sections of the original channel which are not filled with water are easily traceable. This lake is about one and a half miles in length, extending in the main eastward, and was so named because of William Muir's lands bordering upon it and the family residence standing near it. This body of water is narrow and correspondingly deep at places. The bed of it at places is said to be rock, and at other places coal. The supports of the original bridge at the crossing near the Muir residence are known to have stood upon a solid body of coal. In the early history of the county, D. A. Hill used to take out coal on the banks of this channel for home consumption. It is frequently visited by picnic and fishing parties."

SOILS.

The soils of the county are divided into two general groups, the upland and the bottom land. These groups comprise six distinct types. Of these, the upland type (Knox silt loam) which is derived from the drift material and the loess of glacial origin is the most extensive. The type is a silt loam varying in color from light ash gray through all shades of yellow and brown. It is chiefly a productive soil. The other types of the upland group are of very limited area. The bottom soils include those of the Eel River flats and the lowlands of the tributaries, and the low lying tract known as the "Old Reservoir" region. The bottom lands are confined almost entirely to the southern half of the county. The soils have a wide range of adaptability. All of the ordinary crops are grown, many special crops, truck farming and fruit growing, and each finds a soil specially suited for its needs.

There are many local variations in the soil types, but these are of small extent and are not mapped separately. Where special peculiarities or adaptations occur, mention is made of same in the written report. It is not possible or advisable to make a large number of chemical analyses of soil. Some few complete analyses are given and many partial analyses were made to determine certain qualities. Some analyses are also given of samples which have been collected from adjoining areas surveyed and these will show the uniformity of the types of the different areas. About five hundred samples of soil were taken over the county for various examinations and tests.

The soil types are determined by mechanical analyses. The most important thing to be considered in the determination of a type is the texture, which deals with the size of the particle; the structure, which deals with the arrangement; the organic matter content, origin, color, depth, drainage, topography, native vegetation, and natural productiveness—all factors that influence the relation of soil to crops must be taken into consideration.

The grouping known as the soil class is based on texture. All soils are made up of particles of different sizes and by means of mechanical analyses the particles are separated into different grades and the various percentage relationships determine the class of soil. Seven separations are made which are designated as fine gravel, coarse sand, medium sand, fine sand, very fine sand, silt, and clay. The class may be designated as a clay, clay loam, sand, sandy loam, sandy clay loam, gravelly loam, or a stony clay.

A set of soil classes may be so related through source of ma-

terial, method of formation, topographical position and coloration that the different types constitute merely a gradation in the texture of an otherwise uniform material. Soils of different classes thus related constitute a series. Soils may, however, be very similar in origin and texture but may occupy so entirely different topographic positions that their relation to crop production is entirely changed, and this fact would be recognized by another serial name. Many of the soil types in any area have been formed by the same general processes and necessarily grade into one another in respect to all characteristics. It will be observed through this report that wherever possible the term used for the name of the various types are correlated with those used by the United States Bureau of Soils in their classification. There will be found in all areas surveyed soils of local origin and of exceptional characteristics, which will necessarily be given local names, but such soils encountered will be placed as much as possible under the general types, but described as to their importance, peculiar qualities, and their behavior under cultivation.

The maps of each county are constructed on a scale of two inches to the mile and in the process of printing are reduced to a scale of one inch per mile. On a scale of one inch to the mile, a square one-eighth of an inch on each side represents ten acres, and smaller areas cannot be well represented. In many cases terraces are mapped with the valleys. Various markings are used to designate the different soils. On the map all lines such as roads and boundaries are necessarily exaggerated, since a mark one hundredth of an inch wide on the paper will represent a width of nearly fifty-three feet on the ground. In many cases the boundary of a soil type can only be mapped approximately because of gradual gradations or from errors in the base map.

The soil maps are as fairly accurate as can be constructed from the base maps available, and other data which may be found. It is always necessary to be continually checking up all errors which are encountered in the field, but often these errors cannot be remedied unless a plane table outfit be used and a traverse base map constructed in the field. The soil maps should show all township and section lines, roads, both earth and improved, towns, railroads, churches and schools. It is not necessary to attempt to construct a topographic map, but areas rising to considerable distance above the surrounding country and distinct bluffs or the occurrence of a hill in a level tract, such as cut-off hills and lost ridges should be indicated by some special markings.

The following table gives the names of the various soil types and the area occupied by each:

Knox silt loam	212
Wabash silt loam	90
Modi silt loam	36
Wabash clay loam	12
Middlebury sand	3
Sioux sandy loam Sandy clay loam	4
Total	357

Knox Silt Loam.

The Knox silt loam is the same as the Miami silt loam described in former reports. It is the most extensive type in the county. It is the common "yellow clay" seen exposed in ravines and along public roads and railway cuts. This soil is derived from the drift and loess material. In many places the soil is greatly modified by the residual materials which enter into its composition. Where the underlying rocks have entered into the making of the soil, the sand content is usually higher than in the true silt loam.

The topography of the area occupied by this type is in general almost level to slightly hilly. The hills are low and rounded, with gently sloping sides, and intervening valleys are broad and flat. The only abrupt hills occur along the immediate border of some of the streams. The rolling topography furnishes good natural drainage. With proper care there is little injury resulting from erosion, but when the soils are neglected it suffers greatly from erosion and large areas of the subsoil are exposed along the steeper slopes.

Great care is necessary to keep the soil of this type in a high state of productiveness, and a good rotation of crops is necessary to insure the best results. The soil is naturally a productive soil, although the organic content is low. By continual cropping the organic matter is soon removed and the soils become depleted.

The soil is a silt loam averaging from 6 to 10 inches in depth and varying in color from a light ashy gray to brown, according to the amount of organic matter present. Much of the surface in a well tilled field is a loose, floury dust, and the clods which occur are light and porous. The soil should not be plowed when wet, or clods of great size and hardness will be formed, which are difficult to pulverize. On old land this is especially true when the organic

matter is deficient. The light and dark colored areas are easily cultivated and are the most productive, but in places where the color approaches whiteness the successful cultivation is more difficult and the crop yields are not as satisfactory. Such areas usually have poor drainage conditions. Over the surface will be found little iron pebbles. In some places they are very abundant. They will be most readily observed in wheat fields, where the surface has been washed and beaten down to a smooth, compact condition. These are in some places so abundant as to almost cover the surface. It has been found by examination that these pebbles contain a great deal of the plant food which has been taken up from the soil. Lime concretions are also found. Drainage will stop the formation of these pebbles, and the application of lime and manure will render much of the material contained in the concretions available for the growing plant. Soils from such areas give a strong acid reaction and this sour condition must be overcome before the best yields can be secured.

The soil is retentive of moisture but the surface does not become baked because of the silty texture. In the northern half of the county the subsoil contains much more sand and fine gravel than in the southern part.

Corn, wheat, oats, timothy and clover are the principal crops grown. Much of the rougher land is well adapted to pasture, but only a small number of stock are raised on these lands. Considerable tracts of the area are yet timbered, some with the original growth and some with small second growth. In order of acreage, corn is the leading crop. The yield per acre is from 25 to 75 bushels. The white varieties are grown almost exclusively, having replaced the yellow varieties within the past few years. The farmers believe that the white varieties are much better producers. Some, however, value the yellow varieties the higher. Most of the corn is drilled; some few prefer to check. Considerable fertilizer is being used on the corn, but usually in too limited quantities to produce good results. Usually at least two crops are grown in succession.

Timothy holds second place in acreage, about 22,000 acres being grown on this type of soil, and producing from one to three tons per acre. The crop for the year 1911 was, however, very short, the yield being from one-half ton to one and one-half tons. The hay grown is of good quality. When the meadow is allowed to stand many years in succession, other varieties of grass spring up and spoil the grade of the hay. Most of the hay is baled before

being marketed. Usually the hay is stacked in the field and baled later, but some are now having the hay baled in the field as soon as properly dried. This is a labor-saving plan, but balers cannot always be secured. Others have allowed timothy to stand until the seed is fairly well matured, then cutting and throwing up into small stacks for a few days, then thrashing for the seed and baling the hay after the seed is removed. This gives good profit, as much of this hay finds its way into the market as first-class hay and the seed is also sold at good profit. There is some doubt if the seed from timothy cut so early is properly matured so as to give the best results.

Wheat holds third place in importance. This soil is a good wheat soil. The average yield is from 10 to 15 bushels per acre, with some yielding as much as 30 to 40 bushels. Most of the wheat is fertilized. A marked contrast is shown between unfertilized and fertilized. The time for sowing wheat is from September 10th to October 1st. Thrashing is usually begun by the first of July and often by June 25th.

Oats are grown to a considerable degree in some parts of the area, but not to as great a degree as the conditions would warrant. The method of sowing is not very satisfactory in many cases. Some plow the ground and harrow it down in good condition before seeding and then harrow again; others sow in the corn ground of the previous year without even scratching the surface before or after sowing. Good crops may be secured from corn ground by using the disc and then seeding with the drill, or if the ground be loose the drill alone may be used. The average yield of oats is from 20 to 30 bushels per acre; few pieces make as high as 40 bushels. Some attention should be paid to the seed and the method of sowing.

In addition to the grain from the oats and wheat crops, the straw is of much value to the farmer as feed and as a means of restoring organic matter to the soil. Much of the straw is sold from the farm, usually at a price which is a loss to the farmer if he considers the building up of his soil.

Clover of several varieties is grown. The average yield is from three-fourths of a ton to two tons per acre. Some seed is threshed. In most cases timothy and clover are sown together where it is expected to allow the field to stand for meadow. When grown for pasture and fertilizer, clover is sown separate. On some of the rental farms, clover has not been grown for twenty-five years. Clover hay often brings from $10 to $15 per ton, but it is a loss

to the farmer to sell it even at that price. It should be fed on the farm as hay or pasture, or turned under as green manure.

Some rye is grown, but farmers disagree as to the value of rye as a soil builder. Some use rye every year, pasturing it in the fall and turning it under in the spring. One farmer states that a spot on which a rye straw stack stood failed to produce corn for fifteen years afterward. Another says one planting of rye kills the ground for two years.

The Knox silt loam is specially adapted to the growing of tomatoes, and the building of canning factories should make the crop become of much value in the county. For the main crop of tomatoes, a fairly heavy soil is desirable, and one which holds moisture well but has good drainage. There is little danger that the soil be made too rich. On the soil for the tomato crop, from 600 to 1,200 pounds of fertilizer should be used to the acre. The fertilizer used should be specially for the crop and should contain nitrogen 4%, actual potash 6%, and available phosphoric acid 7%.

Truck farming can be made a profitable industry on this type of soil. In several places it is being well demonstrated. The fruit and truck tracts about Clay City, Ashboro, Cloverland, and Brazil show good results from this soil. Apples, pears, peaches, raspberries, blackberries, strawberries, currants, gooseberries are the principal things grown in the fruit line. There is a great opportunity for the production of special crops in many parts of the county. The supply is now largely shipped from other localities and at much higher prices than home production would cost. Strawberries bring about $2.25 per crate, currants $2.75 per crate. Blackberries and raspberries average $2.00 per crate for the early and from $1.00 to $2.00 for the last of the crop.

Practically all the fertilizer used in this county is on the Knox silt loam. The most of the brands used run in the 2–8–2 quality for corn, with about 125 pounds per acre. On wheat, some use a brand containing 14 per cent. phosphoric acid, with about 125 to 150 pounds per acre. It is plain that 200 of the brand is too heavy for wet seasons. On this soil a good fertilizer to use would be about 2 per cent. nitrogen, 7 per cent. potash, and 6 per cent. available phosphoric acid, with an application of from 400 to 1,000 per acre. A sod of clover top-dressed with stable manure affords a good basis for corn, and a crop of cowpeas or soy beans is almost as good. The cowpeas and soy beans have not been grown in the county to any extent and should be given a thorough test. When planted on land which has not had clover or peas or other leguminous

crops, a plan which will insure good returns is a heavy application of stable manure, reinforced by phosphoric acid and potash fertilizer. A moderate crop of corn of 50 bushels per acre actually takes from the soil 67 pounds of nitrogen, 80 pounds of potash, and 31 pounds of phosphoric acid.

Winter wheat grows best on a rather compact, well drained clay loam. In wheat growing, a proper rotation of crops is very important, and it cannot be expected to derive good results from the use of fertilizer alone without rotation. If the wheat can be made to follow a crop of clover or cowpeas, little or no fertilizer is necessary. A proper fertilizer to use should contain about 2 per cent. nitrogen, 6 per cent. potash, and 8 per cent. available phosphoric acid. From 150 to 500 pounds should be used per acre. Many farmers claim that some varieties of wheat are failing to produce good results, but the trouble would appear to be not so much in the running out of the wheat as in the "wearing out" of the soil. Hundreds of test on red and white, smooth and bearded varieties show no constant differences in their yields and in milling values.

The upland soil should produce a better yield of oats. The oats like the other grains need a liberal supply of phosphoric acid, potash and sufficient nitrogen to secure a medium growth of straw. On this soil 100 to 500 pounds of a 3–5–8 brand should give good results. The oats are usually bothered with smut. This may be largely overcome by placing the seed oats for fifteen minutes in water, which has been heated to 132½° F. and not vary more than two degrees from that temperature.

In clover production, the nitrogen may be disregarded, but the potash and phosphoric acid are important. The plants when well established draw sufficient nitrogen from the air. A crop of two tons per acre removes from the soil 96 pounds of potash and 28 pounds of phosphoric acid. A top dressing of lime is also very important for the clover crop.

The large majority of tests made on the soil samples of this upland type show the soil to be acid or sour. Lime is needed on such soils. The lime hastens the decay of the plant remains in the soil and this aids in the availability of the plant food. It makes sour soil sweet and also improves the physical character of heavy soils. The lime may be applied in the form of commercial lime, waste lime, lime plaster, ground raw limestone or any other form. In the use of raw limestone from two to 20 tons should be

applied according to the nature of the soil and the crop grown. Good results have been obtained from such applications.

RESULTS OF MECHANICAL ANALYSES OF THE KNOX SILT LOAM.

No.	Locality.	Description.	Fine Gravel, Per Cent.	Coarse Sand, Per Cent.	Medium Sand, Per Cent.	Fine Sand, Per Cent.	Very Fine Sand, Per Cent.	Silt, Per Cent.	Clay, Per Cent.
21a	½ Mile West of Lena County Line	Surface 12 in.	.15	.15	1.50	4.55	7.0	75.0	18+
21b	½ mile west of Lena on county line	Subsoil 12 in. to 48 in.	.15	.15	1.05	10.15	11.0	64.0	13.50
22a	2¾ miles west of Lena.	Surface 18 in.	.0	.01	.20	1.05	1.60	86.0	15.20
24a	1 mile north of Eagles.	Surface 12 in.	1.64	.30	1.05	3.25	5.60	75.50	14+
56a	1 mile south of Eagles.	Surface 8 in.	.0	.0	.10	.63	4.50	78.0	16.
63a	1 mile north of west of Staunton	Surface 6 in.	.35	.05	1.15	11.0	15.0	60.	12.45
134	Center Sec. 30 Clay City	Surface 12 in.	.10	.10	.40	3.05	4.10	77.10	14.0
136	The George Kaiser Clay Plant, Clay City	Surface 12 in.	.10	.15	.40	.50	6.0	80.0	14.75
136a	The George Kaiser Clay Plant, Clay City	Subsoil 12 in. to 84 in.	.10	.0	.40	2.80	4.50	92	+
77	¼ mile north of Cory	Surface 12 in.	.10	.80	.50	1.30	6.25	76.10	13.75
	¼ mile east of Longnacker S. H.	Surface 12 in.	.0	.20	.10	.30	9.0	68.15	21.40
	¼ mile east of Longnacker S. H.	Subsoil 12 in to 30 in.	.20	.50	.50	.60	3.30	70.25	22.0
121	Owen-Clay Co. line S. Bowling Green	Surface 18 in.	.40	.50	1.50	5.50	6.50	84	+
114	Center Sec. 3 S. Poland	Surface 12 in.	.20	.30	1.20	3.80	4.25	90	+
	2 miles S. W. Nails Mill	Surface 12 in.	.40	.50	.50	1.50	5.15	91	+

Analysis of Surface 12-inch Sample Taken One and One-half Miles Northeast of Harmony.

Collector, Shannon.

Description	No. 5 Clay "Surface 12"
Reaction to litmus	Neutral
Moisture at 105°C. from air dried soil	0.97%
Total soil nitrogen	0.054%

Analysis of fine earth dried at 105° C.—

Volatile and organic matter	2.75%
Insoluble in 1.115 HCl	90.14%
Soluble silica ($S:O_2$)	0.18%
Ferric oxide (Fe_2O_3)	1.10%
Alumina (Al_2O_3)	4.78%
Phosphoric acid anhydride (P_2O_5)	0.09%
Sulphuric acid Anhydride (SO_3)	0.08%
Calcium oxide (CaO)	0.52%
Magnesium oxide (MgO)	0.43%
Potassium oxide (K_2O)	0.14%
Sodium oxide (Na_2O)	0.23%
Total	100.43%

The following analysis is from a mixed sample made up from several locations over the county where this type of soil is best developed. No. 1 is sample of the surface soil, No. 2 of the subsoil, and No. 3 and 4 is a mixed sample of surface and subsoil made up from parts of samples from different parts of the county:

Collector, Shannon.

Description	No. 1 Clay Surface.	No. 2 Clay Subsoil.	No. 4 Clay Subsoil. No. 3 Clay Surface } Mixed
Reaction to litmus	Neutral	Neutral	Neutral
Moisture at 105° C. from air dried soil	1.53%	2.27%	1.58%
Total soil nitrogen	0.040%	0.052%	0.075%
Analysis of fine earth dried at 105° C—			
Volatile and organic matter	2.98%	3.71%	3.60%
Insoluble in 1.115 HCl	87.28%	83.15%	85.92%
Soluble silica ($S:O_2$)	0.21%	0.22%	0.20%
Ferric oxide (Fe_2O_3)	1.86%	2.99%	2.05%
Alumina (Al_2O_3)	6.21%	7.89%	6.95%
Phosph. acid anhydride (P_2O_5)	0.13%	0.14%	0.10%
Sulphuric acid anhydride (SO_3)	0.13%	0.14%	0.12%
Calcium oxide (CaO)	0.59%	0.66%	0.56%
Magnesium oxide MgO)	0.53%	0.82%	0.50%
Potassium oxide (K_2O)	0.20%	0.29%	0.23%
Sodium oxide (Na_2O)	0.41%	0.67%	0.38%
Total	100.53%	100.68%	100.61%

The following tables of analyses are given to show the uniformity of the type over large areas:

MECHANICAL ANALYSES OF COMMON LOESS.

LOCALITY.	Description.	Organic Matter, Per Cent.	Gravel, Per Cent.	Coarse Sand, Per Cent.	Medium Sand, Per Cent.	Fine Sand, Per Cent.	Very Fine Sand, Per Cent.	Clay and Silt, Per Cent.
Mixed Samples—								
No. 45	Surface	1.50	.0	.50	.75	.95	4.10	92+
No. 46	Subsoil	.60	.50	.75	.60	1.05	4.85	91+
Clay Pit South Side Princeton	Surface	2.10	.10	.20	.50	.75	6.00	90
	Subsoil	.50	.25	.50	.80	1.10	7.50	89

Chemical Analysis of Surface of Loess.

Collector, Shannon.
Laboratory number, 45.

Reaction to litmus	V. F. Acid
Moisture at 105° C	2.41
Total soil nitrogen	.125
Carbon dioxide	.....
Analysis of fine earth dried at 105° C—	
Volatile and organic matter	3.655
Insoluble in (1.115 sp. gr.) HCl	88.395
Soluble silica	.031
Ferric oxide (FE_2O_3)	3.211
Alumina (Al_2O_3)	3.911
Phosphoric acid (P_2O_5)	.156
Calcium oxide (CaO)	.279
Magnesium oxide anhydride (MgO)	.398
Sulphuric acid anhydride (SO_3)	.036
Potassium oxide (K_2O)	.245
Sodium oxide (Na_2O)	.254
Total	100.051

Chemical Analysis of Subsoil of Loess.

Collector, Shannon.
Laboratory number, 46.

Reaction to litmus	Acid
Moisture at 105° C	3.54
Total soil nitrogen	.074
Carbon dioxide	....
Analysis of fine earth dried at 105° C—	
Volatile and organic matter	3.398
Insoluble in (1.115 sp. gr.) HCl	84.721
Soluble silica	.073
Ferric oxide (FE_2O_3)	4.641
Alumina (Al_2O_3)	5.283
Phosphoric acid (P_2O_5)	.145
Calcium oxide (CaO)	.231
Magnesium oxide anhydride (MgO)	.477
Sulphuric acid anhydride (SO_3)	.029
Potassium oxide (K_2O)	.372
Sodium oxide (Na_2O)	.192
Total	99.562

Modi Silt Loam.

This soil over the area is a modified form of the Knox Silt loam. In previous reports on the soil survey of Indiana counties it has been included in the regular upland type, the Miami Silt loam,

or as used in this report, the Knox Silt loam. In the area of this survey it was readily observed that in the upland soils there was a difference in fertility, state of tilth and productiveness. These areas of the better condition have thus been mapped as the modified silt loam. The topography is as a rule more even than that under the Knox Silt loam, drainage is better, and the general condition is improved. In most places no distinct line can be drawn between the two classes of soils, but it was found advisable to map them separately so far as possible. The general condition as to origin, texture, etc., will be found under the description of the Knox Silt loam.

Low Land Types.

Wabash Loam and Silt Loam.—These types are the soils found in the Eel River bottom and the tributary streams. The soils are mapped together. The soil varies through all grades from loam and silt loam to fine sandy loams. The areas are not well defined, and so far as the mechanical character is concerned the productiveness is the same.

The Wabash loam consists of a light brown to yellowish brown loam about 10 inches deep, containing usually a high percentage of fine sand and in some places some gravel. The darker color is found when the silty content is highest and the lighter color when the sand is more abundant. There is but a small amount of coarse sand and a comparatively small amount of clay. The soil is a soft, fine-grained alluvium, and does not become compact enough to form clods. The amount of organic matter varies. The soil is easily cultivated and produces good crops, especially of corn. This is the principal type found along the tributaries. In most places along the smaller streams there is an increased amount of sand and also of rock fragments which have come in from the upland and weathering bluff. The soil owes its origin to the wash from the uplands; the sand being derived from the disintegrating Mansfield sandstone and the shaly formations along the north and east tributaries.

The subsoil is usually a heavy brownish yellow loam, from 2 to 4 feet deep, overlying a sandy or gravelly loam.

The Wabash silt loam varies from the Wabash loam in the more silty nature and the higher clay content. The soil is about 12 inches in depth, underlain by a heavy silt loam. The soil to a depth of two feet or more is dark brown to black color. In some places the sand content of the finer grades is from 15 to 20 per

cent., underlain by a more sandy type. The soft, fine-grained quality of the soil due to the silt and very fine sand gives a loose, open, mellow structure, and any clods found are readily pulverized.

Along the smaller streams, practically all the bottom land is in cultivation and gives good yields of corn, wheat, oats, meadow and truck growing. The greater part of the area is in the Eel River bottom. The valley is from one-half to more than three miles in width. The area is subject to overflow. The most of the material now brought down by the floods is the light yellow silt from the cultivated uplands. In the earlier days of the agricultural development of the county the sediment left after each inundation was much darker in color and doubtless consisted of the humus bearing material from the virgin soils then in process of clearing.

Levees have been constructed along the river and the damage from floods is not so great as formerly. The bottoms from Poland past Bowling Green to about Nail's Mill are in a good state of cultivation and produce excellent crops. Below this point the crops have been repeatedly destroyed by floods until no one feels safe in taking up the cultivation of the land. Natural drainage conditions are bad and good artificial drainage cannot be accomplished until something is done to give a better action to the river. The soil in the lower part is just as good as that in the upper part, except where the stagnant waters have leached the plant foods. The plans concerning the drainage of the lowlands of the county are discussed in another part of this report.

In the better parts of the Eel River bottoms the land is valued at $100 to $200 per acre, but there is little that is for sale even at $200 per acre. Corn yields on the average 50 to 75 bushels. At Eel River station on the Jake Luther farm, a field across east from the station yielded in 1910, 98 bushels of corn per acre, and the prospects were even better this season, July first. It is said that this field had at one time been in corn continuously for fifty years and that the last year it produced 45 bushels per acre. The crop plan the past several years has been corn two years, then sow to wheat in the fall and clover in the spring, then the second spring back to corn. Two years ago the wheat yielded 20 bushels per acre and after the wheat was harvested the crop of clover was cut and 107 bushels of seed thrashed from the 75 acres.

In the summer of 1911 a tract of seven acres, one mile southeast of the station produced 225 bushels, a yield of 32 1-7 bushels per acre. To the southwest of the station on the Weber farm, 75

acres of stalk ground wheat averaged 24.5 bushels. Other pieces as compared with these were estimated at 40 bushels.

Timothy makes a very rank growth on the bottom and is usually of good quality; in wet seasons it is rather coarse. In 1911, the yield was two tons plus per acre, while the upland hay averaged less than one ton per acre. The corn is usually cultivated four or five times, or as long as it can be plowed. It is usually four to eight feet high and tasseling by July first. Clover is often sown in wheat and then turned under in fall for another crop of wheat. In the better grades of the soil a second season stand of clover is too much for the wheat, causing it to grow so rank that it cannot stand until mature.

Much of the land in the bottom is rented and the average yield of crops is thus somewhat cut down. Terms of rent for corn are one-half in the crib, when tenant furnishes everything; in other cases the land owner receives one-third when tenant furnishes all. In wheat, tenant furnishes half, pays half the thrashing and receives half the wheat, or furnishes all, pays all the thrashing and takes two-thirds of the grain.

Throughout parts of the area, sheds are common along the road where tenants keep their horses and tools in working seasons. Wells are also very plentiful. Water is obtained at a depth of from 10 to 30 feet. Some of the tenants move out to shacks or live in tents during the crop season, when leave until the crop is mature.

Many of the landowners have their farms part in the bottom and part in the upland. The best of the hill land is valued at from $50 to $75 per acre. The fertilizer used on the upland is chiefly of the 2–8–2 formula, mixed with bone to insure a stand of timothy. The average yield of wheat on the bottom is 15 to 25 bushels; on the adjoining upland average 15 bushels.

The river bottoms were originnaly timbered. On the second bottoms, black walnut, beech, burr oak, sugar and sycamore were the prevailing types, with some poplar, white oak and buckeye. One sycamore between Eel River station and Old Hill, said to have been so large that when it fell a man could walk in the hollow trunk for 60 feet, and that farmers laid poles up against the sides for shelter for stock, and the hogs slept in the hollow tree. Sassafras and persimmon are very rare on the bottoms. On the first bottom, sweet gum, hickory, white oak and ash are common; cotton

wood, black and peach leaved willows, and river maple grow abundantly in the lower bottoms and along bayous. Steel weed, smartweed and horse weed grow rank and dense.

In the valley of Jordan Creek is found some good soils of the regular types, but much of the area is not under cultivation. In the Birch Creek bottom the soils have been pretty thoroughly leached. The surface four to eight inches is usually very white and somewhat compact but pulverizes easily. The crops grown are chiefly in small patches because of poor drainage conditions. Water lilies, swamp grass and reeds are common in the sloughs and bayous.

The fertility of the river bottoms is evidenced by the large cribs, barns, and many good farm residences, the good methods and machinery used and the general thrift of the people. Good drainage conditions would bring about the improvement of a large area and bring much wealth into the county. The contrast is very marked between the different parts of the area, due to the present drainage conditions. During the year 1911 hundreds of acres of good soil were lying idle in the south part of the river bottoms. For the two years past crops put in were destroyed by flood, and the farmers became so discouraged with the conditions that they will not run the risk of putting in the crops. This part of the area should be made just as productive and well improved as the parts farther to the north.

The drainage commission has prepared a full report on the drainage conditions, and this, along with a petition from the landowners, has been filed, and reported on favorably. A new channel is being located, and the cost of the enterprise will be approximately a quarter of a million dollars. At least 25,000 acres of land will be directly benefited. It is expected that the contract will be let for the work during the winter of 1912-13.

The mechanical analyses of the lowland soils are as follows:

RESULTS OF MECHANICAL ANALYSES OF WABASH LOAM.

No.	Description.	LOCALITY.	Fine Gravel, Per Cent.	Coarse Sand, Per Cent.	Medium Sand, Per Cent.	Fine Sand, Per Cent.	Very Fine Sand, Per Cent.	Silt, Per Cent.	Clay, Per Cent.
126A	Surface 10 in...	River Bottom Eel River Station.....	.0	.3	1.1	29.4	30.2	32.7	6.0
113	Surface 12 in...	S. W. ¼ Sec. 30 N. W. Bowling Green..	.0	.5	2 0	26.5	30.5	32.5	7.5

RESULTS OF MECHANICAL ANALYSES OF WABASH SILT LOAM.

No.	Description.	LOCALITY.	Fine Gravel, Per Cent.	Coarse Sand, Per Cent.	Medium Sand, Per Cent.	Fine Sand, Per Cent.	Very Fine Sand, Per Cent.	Silt, Per Cent.	Clay, Per Cent.
126	Surface 10 in...	River Bottom Eel River Station.....	.0	0.1	0.2	12.4	23.6	50.8	12.7
149Y	Surface 10 in...	River Bottom N. E. Howesville.....	.0	1.6	0.9	6.7	10.4	61.6	18.7

WABASH CLAY LOAM.

This soil comprised an area of more than 3,000 acres in the southwest corner of Perry Township. The area is known as the Old Rerservoir Region. It lies on the west side of the bend of Eel River, and extends from about one-half mile south of the old Wabash and Erie Canal in Sections 5 and 6 to as far south as Old Hill. In elevation it lies below the 540-foot contour line. Part of the area falls to an elevation of about 520. The low water mark at Old Hill is 525 feet. From this it will be seen that the drainage is a very difficult proposition. In the days of the construction of the canal a levee was thrown up across the valley from about the location of the Junction school to Old Hill. This flooded an area of about 4,000 acres, of which one-fourth was covered with timber, soon in a state of decay. This fact was very objectionable to the people of the vicinity, because of its supposed malarial effects. With the building of the Feeder Dam and Birch Creek reservoirs the opposition was increased to such an extent that the canal company was forced to place the matter before the Legislature and it was necessary for the works to be protected by the State Militia.

The old embankment has been practically all destroyed and at present this part of the course shows, where the old line of the canal existed, only a ditch-like depression almost filled in places and the remains of the old levee on the west side. A public road now runs along the east margin of the old canal.

The following account from Wm. Travis' History of Clay County concerning the construction of the Old Canal will explain the origin of the reservoirs of the county:

"In the year 1827, the Congress of the United States made a grant of lands for the construction of the Wabash and Erie Canal with Toledo and Evansville as terminals. In 1830 and 1831 the Legislature of the State authorized the commencement of its con-

struction and work was actually begun in 1832 on that section lying between Toledo and Lafayette. That part of this thoroughfare lying between the Wabash River at Terre Haute and White River at Worthington was known as Cross Cut. This section crossed Clay County intersecting Perry, Lewis and Harrison Townships. Its course through the country was northwest to southeast, nearly 20 miles in extent. The construction of this canal was a part of the system of internal improvements undertaken by the State. As a summit divide between the White and Wabash rivers lies in this county, in part, both ends of the Cross Cut had to be fed from the waters of Eel River and its tributaries. This necessitated the construction of the Feeder Dam and Splunge Creek reservoirs. The building of the former was commenced in 1837 and completed within two years. At the same time the construction of the side cut for conducting the water from the dam to the main canal was in progress. As the line of this canal lay across Birch Creek, an aqueduct across the stream was built in 1838. No work had yet been done by the State on the lower section of the Cross Cut between the Junction and White River. Owing to the depressing effects of the financial panic of 1837 the State was unable to meet its obligations incurred in the progress of its internal improvements and work on the Wabash and Erie Canal ceased in 1839.

"In 1845, the people along the line of the proposed canal began a general agitation of the necessity for its resumption and completion and petitioned the Legislature accordingly. In answer, on the nineteenth day of January, 1846, an elaborate bill was passed which was supplemented by another in 1847 and operations were resumed the same year. Much of the work which had been previously done by the State was going rapidly into decay. The canal was completed to Terre Haute in the fall of 1849, the first boat arriving on the 25th day of October. Meanwhile the work was progressing in Clay County on the Cross Cut, the Side Cut and the Feeders. Eel River dam and the Birch Creek aqueduct were rebulit. Splunge Creek reservoir was made by throwing up an embankment across the valley from the foot of Old Hill two miles north of the junction of the Side Cut with the main canal. This work was completed in 1849 or early in 1850 and the reservoir filled with water in the fall of the latter year. The Side Cut, leading from the dam to the reservoir, a distance of seven miles, was completed and the water let into it in the spring of 1850. On the first day of May, the water from Eel River first reached Terre Haute through the Cross Cut. As soon as the canal was sufficiently filled

to admit of navigation, communication was established between Terre Haute and Bowling Green as slack water on Eel River extended as far up as the Thomas Ferry.

"The opening of the canal stimulated business enterprises and commercial activity. At Bowling Green, the head of slack water navigation, the firm of Fuller, Milton and Kennedy, composed of Jesse Fuller, John M. Milton and Joseph Kennedy, built a warehouse just below the bridge, which was afterward converted into a brewery, and also built the canal boat "Belle of Bowling Green," which first went out in August, 1860, in command of John W. Eret, loaded with grain and bound for Lafayette. From this time on the 'Belle' continued to make regular trips to Lafayette and Toledo taking out grain and produce and bringing back to Bowling Green such freights as the local trade demands. After passing from the Side Cut into Eel River, boats were pulled or towed to Bowling Green. As a motive power to facilitate this work, the firm heretofore named constructed a rude tow boat, which bore the euphonious name 'Bull of the Woods.' In 1851, a company was organized to build a small steamer to propel canal boats up from the dam, of which Oliver Cromwell, Sr., was the leading spirit. But from delay of execution the project was abandoned. Some years later, after the dissolution of the firm of Fuller, Milton and Kennedy 'The Ohio,' owned and operated by John W. Eret and John M. Milton, made regular trips up to the spring of 1861, when it went out for the last time, taking a mixed load of produce. This was the last boat ever seen at Bowling Green.

"After the opening of navigation, A. H. L. Baker, who had real estate interests at the bend of the river, three miles south of Bowling Green at the mouth of Six Mile, conceived the idea of building up an important commercial center and resort at this place. Though his plans were much more visionary than substantial, he proved his faith by his works in the building of a large warehouse and a commodious hotel, having a large number of rooms and numerous outlooks, a house of greater proportions and pretensions than any hotel building now in the county. This building, however, was never completed and used as originally desiged. The town which was laid out at this point in 1852 was named Bellaire from the circumstance that Mr. Baker had lived for a time at Bellaire, Hartford County, Maryland. He too engaged in canaling and owned and operated the boat known as Eight O's. The Julia Dean, which was owned and run by James M. Mushett, did business regularly at Bellaire and made occasional trips to

Bowling Green. Mr. Baker was succeeded in business by Lewis Row, who bought and shipped a great deal of grain. In 1857, Nicholas Goshorn and Son located at this point, built a second warehouse, did shipping for several years and continued merchandising up to 1865. Though this town had several stores and a post-office and shops for several years there are now no marks remaining on the site to indicate that it ever existed. At the dam, private investment and improvement began at a much earlier date. The town of Anquilla, at first known as New Amsterdam, was laid out in 1838. As early as 1842 or 1843 the Wines Brothers, Terre Haute, built a large sawmill and flouring mill, and also engaged in general merchandising. The mill was run for several years, up to 1850 probably, when the machinery was removed because of the instability of the foundation from the encroachment of the water. The Wines Brothers were succeeded in the mercantile business by Thomas Harris, and W. F. T. McKee built a sawmill near the site of the former one which he operated up to the time of the abandonment of the canal. Shipping lumber to many distant parts of the country, selling the best quality of poplar and walnut lumber at fifty cents a hundred. There was also a post-office at this point for a period of twelve or fifteen years. This town too has been vacated and the passerby does not now see that a manufacturing business nor a canal feeder ever existed here. Besides Eel River and Splunge Creek, Birch Creek was made to contribute to the water supplies of the Wabash and Erie Canal by the construction of Birch Creek reservoir, in the central part of the county, to which a branch or side cut was made from that confining this body of water, was thrown across the valley from east to west between elevated grounds on either side and was a half mile in length, now the wagon road west from the railroad station. A part of Saline City and a section of the track of the Terre Haute and Southeastern Railroad are now on the site of this feeder. This reservoir was built as late at 1853. The total extent of water transportation in the county, including the side cuts and Eel River slack water, was about 40 miles. From the best information which we have been able to command the Cross Cut was used for a period of ten years, the first boat having passed through from Terre Haute to Worthington in the spring of 1851 loaded with salt, and the last one from Worthington to Terre Haute in the spring of 1861 loaded with flour belonging to Augustus Stark and bound for Lafayette and Toledo."

The area of Splunge Creek was always flooded during the wet season by the overflow of Eel River, and from 1,200 to 1,500 acres were under water except in the drier seasons. The higher portions of the ground were overgrown with a most luxurious growth of wild grass or weeds from two to six feet high, and with the coming of the flood this material was washed down to decay.

The reservoir region was first visited on April 22, 1911; at this time about five sections were under water and it was stated by people of the vicinity that the waters were not so high as they had been for the past three years. Only a very small percentage of the area is ever under cultivation. Much of the ground has a growth of black willow, swamp grasses, horse weed and giant smartweed. Marsh hawks inhabit and nest in this region in abundance. Mudhens, bittern, etc., are plentiful and the area furnishes a stopping place for wild duck and geese in their migrations. Many hunters go to this area, but the inaccessible means of getting over the ponded parts makes hunting rather difficult.

Embankments have been thrown up in various places to attempt to save parts of the area from the water, without success. Splunge Creek passes through the area and several open ditches have been cut, but the outlet is so poor that these ditches cannot perform their work. Several plans for better drainage have been proposed. If the present plan to change the mouth of Eel River is carried out, the water may be successfully carried from the area into Eel River at Old Hill; or if the Connelly Ditch should be cut through to the river and allowed to carry the flood water, the conditions would be helped. A flood gate has been placed at the mouth of Splunge Creek at Old Hill to prevent the flood waters from backing up into the creek and adding to the flood of the area, but this has not proved satisfactory.

Another proposition is to construct a ditch around the border of the area to catch and carry away all the water coming in from the higher land surrounding, and then if necessary use windmills to pump the water from the lowest parts of the area, over into the ditches, where it would be carried away. Under present conditions this would necessitate the cutting off of the mouth of Splunge Creek to prevent the flood water from encroaching by being backed up from the river. There is a tremendous piece of work here for some one who will find a scheme by which the area may be drained. A cost of $10 to $20 an acre for a successful piece of work would be a paying investment to the individual owners and a source of great increase to the county.

In addition to the surface of the area lying below the 540 contour line the area up to the 560 line is frequently too wet for cultivation. On the opposite side of the river a tract of 10–15 square miles is often flooded. In the upper part of the valley about Bowling Green there has been no severe flood since 1875.

On July 12–15 the reservoir region was again visited for investigation by the Survey. All the water was confined to the creek and ditch channels and these were very low and in some places entirely dry. The season was an exceptionally dry one and some parts of the area might have been put under cultivation but for the uncertainty of the crops having a chance to mature. The ground was dried out very hard and cracked about three to four inches below the surface. This layer of soil seemed to represent very recent deposition and the layer separated radily from the underlying soil.

The soil varies in color from ashy gray to white. It is a silty clay loam from six to 24 inches deep. The subsoil is a gray to white plastic to very tenacious silty clay. The surface is very level except for small mounds from one to five feet high. The soil although having a hard appearance is not difficult to pulverize. When a fresh surface of the soil is exposed it weathers into cubical fragments, which continue breaking up until they are very fine. The soil is chiefly the reworked silt loam of the upland type. Many pebbles of a concretionary nature consisting of iron, lime, etc., occur over the surface and in the soil. These pebbles are formed by the leaching out of materials from the soils by stagnant waters.

Very little can be said as to the yields of various crops because of the small amount of farming done within the area. But every indication is that the soils are of a productive type and under proper conditions would give excellent yields.

The areas which were included in the Birch Creek and Feeder Dam reservoirs have soils very similar in character and appearance to those of the Splunge Creek region. But these areas are for the most part well drained and give good crop production. The soils are of a light color, much leached and streaked, but careful cultivation is placing these soils among the best of the county. These areas are classed with the silt loam type. Those of the lowlands and flats with the Wabish silt loam and those of the slightly higher elevation with the Knox silt loam.

MECHANICAL ANALYSES OF WABASH CLAY LOAM.

No.	Description.	LOCALITY.	Gravel, Per Cent.	Coarse Sand, Per Cent.	Medium Sand, Per Cent.	Fine Sand, Per Cent.	Very Fine Sand, Per Cent.	Silt and Clay, Per Cent.
15	Surface 12 in....	Splunge Creek Reservoir.....	.0	.05	.20	1.25	4.0	93.50
128	Surface 12 in....	S. Saline City Old Reservoir.	0.5	.10	.20	2.0	3.8	94+

Approximate Chemical Analyses for Wabash Clay Loam.

White Soil—Surface 12 inches.

Reaction to litmus	Acid
Total soil nitrogen	.090
Volatile and organic matter	2.819
Insoluble in HCl	92.000
Soluble silica	.085
Ferric oxide (Fe_2O_3)	1.415
Alumina (Al_2O_3)	2.447
Phosphoric acid anhydride (P_2O_5)	.090
Calcium oxide (CaO)	.508
Magnesium oxide (MgO)	.440
Sulphuric acid anhydride (SO_3)	.052
Potassium oxide (K_2O)	.213
Sodium oxide (Na_2O)	.305
Total	99.924

MIDDLEBURY SAND.

The town of Middlebury or Martz is situated on a sandhill, the summit of which is about 100 feet above the general level of Clay City. This sand soil is not an extensive type. It caps the hill over an area of about 80 to 100 acres and extends out to considerable distance with arms to the northwest and to the south. Similar sand also occurs along the bluff of Eel River on the north side at New Brunswick and extending in limited areas to the east and west.

The sand is a medium fine to coarse sand of brown to gray or yellow color. It is usually quite uniform in texture. The subsoil is somewhat compact and grades from yellow to brown in color. Where the soil is under cultivation it is chiefly in truck and fruit, raised for family supplies. Some parts about Middlebury are in field cultivation, as is also the area about New Brunswick. Wheat and oats grow well. Some melons are grown and the soil seems well adapted to this crop. Hay produces well. Some tomatoes are put out for the canning factory at Clay City. This crop grows and

produces well. At New Brunswick the sand is on the average about four feet thick. The entire area of Middlebury sand should prove of great value for truck crops and melons and should be devoted to this work.

SUMMARY.

Clay County should become one of the most prosperous agricultural communities. The large majority of the landowners and farmers are progressive people. Many good, substantial farm improvements are being made, good houses, well built barns, and shelter for stock and machinery.

The climate is favorable for all agricultural pursuits common to this part of the country. There are no great extremes in weather conditions. The rainfall is fairly evenly distributed, and the period between killing frosts is about twenty-four weeks.

The greater part of the county was originally timbered. On the lowlands the principal growths were the oaks, ash, hickory, black gum and sweet gum. On the margins of the streams were the sycamores and cottonwoods and on the uplands black walnut, burr, white, red and black oak, hickory, beech, sugar maple and poplar. The undergrowth consisted chiefly of redbud, sassafras, dogwood, pawpaw, blackhaw, hazel, sumac, etc. The timber afforded the material for the principal industries of the early days. Some of these industries were lumbering, chair manufacturing, poplar shingles, hoop-poles, grain cradles, barrels, tubs, buckets, fanning mills, measures, pump stocks and cordwood.

A small sawmill at Ashboro saws lumber for local use and also furnishes a large supply of mine props, consisting chiefly of oak, hickory, birch, beech and elm.

Tile drainage is receiving considerable attention and farmers are well repaid for their work and expense. In general, a tile from eight to 14 inches in diameter is used for the mains and smaller, down to four inch, used for the arms. In best drained areas, 4-inch tile have been put in at every 40 feet, but most generally the tributary arms are about 100 feet apart.

Seepage water and springs occur all along the lines between the upland and bottom land and makes drainage difficult in small areas. This is, however, a good source of water for stock. A large number of ponds in the silt clays of the upland also furnish water supplies. The wells in the county are from 25 to 100 feet deep and the water is as a rule good for drinking and domestic purposes.

It is estimated that 75 per cent. of land in Indiana is rented under various conditions. This lowers the standard and thrift which should be shown among the farming population. Under the ordinary methods of renting, the farms are run down and the tenant takes from the farm all that is raised, all that it is possible to get from the ground. When a tenant has use of the same ground for a number of years the conditions are much better. If the landowner and tenant go into partnership in the farm management, good results are usually obtained. A large percentage of land in Clay County is farmed by tenants. The terms of renting vary somewhat in different parts of the county. In some cases the tenants furnish everything and crib the corn and take one-half; in other cases the tenants receive two-thirds. In wheat, when the tenant furnishes half the seed and pays half the thrashing, he receives one-half the wheat; if he furnishes all and pays all thrashing bills, he receives two-thirds of the wheat. Some tenants are hired by the month to manage the farm. Tenant furnishes part or all of horses and machinery, receives use of garden plot and a share of fruit and receives from $50 to $75 per month, according to amount of material furnished. Some land is rented for cash at from $5 to $10 per acre.

Farm labor, single-handed by the month is at the rate of about $1 per day. Harvesting season prices are from $1.50 to $2.50 per day. It is becoming very difficult to secure good farm help.

Hay harvest usually begins about July 10th. Good methods and up-to-date machinery are used in caring for the hay. Thrashing is usually well under way by July 4th. The greater part of the corn crop is husked from the standing corn, but the use of shredded fodder is greatly on the increase.

Large areas of the more rugged parts of the land should be devoted to grazing, and dairying would become a paying occupation. More creameries are needed in the county and inducements will be offered for their establishment.

In the vicinity of Seeleyville, Cloverland and south, most of the farmers run small dairies in connection with their farm work. The interurban line furnishes good transportation for the industry. The farmer receives about 18 cents per gallon for the milk and pays about one and a half cents for transportation. The price received, however, is based on the percentage of butter fat.

When cattle are kept for dairying purposes, most farms are kept up in good condition since all crops raised are fed on the

farm and turned back to the soil. Many farmers use cream separators and are well pleased with their use and would not be without them even when only two or three cows are kept. Herford, Short Horn, Jersey and Holstein cattle are raised chiefly. A few men raise a considerable number of cattle, hogs and sheep and ship their own stock to Chicago and Indianapolis markets. Taking the county as a whole, stock raising receives comparatively little attention. While some live stock is kept on each farm operated by the owner, the greater part of all the crops produced is sold at the local markets.

The young clover was practically a failure over the entire county in the spring of 1911. This was probably due to two causes; on account of the very dry spring much of the seed did not germinate, and that which did make some growth was burned by the excessive drought. It was also true that much of the seed was inferior. In the fall of 1910 much of the clover was late in maturing and was bitten by the early heavy frosts and much of the seed thrashed from late fields was immature. In many cases farmers who spent as much as $50 to $100 for clover seed met with utter failure of a new stand. Good seed is the important thing in successful clover growing. Every farmer who is not thoroughly familiar with the appearance of good clover seed should have his seed tested. The seed should be tested as to the quality of the seed and also for impurities. Six to ten dollars a bushel is a high price to pay for imperfect and impure seed. It is better to buy good seed at a high price than inferior grades at a low price.

A large acreage of timothy meadow is grown in regions about Cory, Ashboro, Center Point and Saline City. The yield is from one and a half to three tons per acre. Much of the hay is baled before being sold from the farm. Timothy grows well in both upland and bottoms, but is rather coarse in lowlands.

Alsike clover mixed with one-fifth timothy gives good results for pasture in the Birch Creek bottoms. Alfalfa has been grown to a small extent on the adjoining uplands. The alsike clover is specially adapted to wet, clayey soils and will stand overflows better than the red varieties. When stiff, clayey spots occur in a field, a mixture of alsike and red varieties will usually insure a good stand. The alsike clover comes in and makes a full stand on the wet places. It is the thin spots which cut down the average yield for the field.

There are still some good pieces of timber in the region about

Ashboro and between Staunton and Cory and to the west. The principal tree growth of these areas are the oaks. In the northern part of the county the tree growth is almost wholly beech. River birch, black willow, sycamore, red maple, river maple, Carolina poplar, elm and some oak make up the growth along Birch Creek.

In the Birch Creek bottom south of the station at Ashboro, ground ivy or myrtle covers the ground with such a dense growth that all grasses and weeds are crowded out.

In a number of places, rows of black walnut, red maple and catalpa trees have been planted along roadsides and about farm yards, which add much to the attractiveness of the place and show an interest in the growing and care of trees. The shading along the road is also a great saving to the roadway. Black locust is native to the county and grows abundantly along roadsides and on rough lands. Numerous plantings have been made and in most cases do well. The borers, however, have caused much trouble in the growing of locust trees. The borers also infest some of the maple trees and cause the young trees to fall. There is no remedy for locust trees which are infested with borers and no practical way to prevent infestation. The adult is a brown bettle marked with yellow, another species of the same, bores in hickory.

In past years it has been a common practice to plant juniper or red cedar trees along apple orchards, and but few have realized the injury to the apple crop from the rust of the cedar apple. Several places were observed where the cedar trees were either in the orchard or around the edge as wind breaks, and the trees were loaded with the fungus apple. Such trees should be destroyed. If wind breaks are desired some other sort of a tree should be used.

Several farmers have put out groves of catalpa, usually of about 1,000 trees, planted on an acre or more of ground. The trees grow well and where they have not been injured by the catalpa sphinx are in good condition. J. C. Moss at Ashboro has an excellent grove six years of age which has never been troubled by insects. He also notes that but few insects of any kind are found in catalpa groves, even flies are scarce, and such groves would afford good retreats for picnickers and places for quiet rest in the shade. Mr. Keller's grove south of Staunton and Mr. Van Vacky's grove south of Seeleyville are of trees three to four years old and have never been troubld by insects. To the northwest of Cory are several groves, the largest of which are on the farms of E. B. Collins, Wm. Miller and H. E. Miller. These are all the third season trees

but have been badly defoliated by the sphinx two years in succession. Last year the leaves put out and were killed by frost, and when the new leaves were later put out they were destroyed by the worms. In 1911 the trees had been completely defoliated by June 20th and the new leaves were beginning to put out and would probably be visited by another brood. The trees average in height from four to eight feet. In most cases the proper pruning of the trees is neglected. Agents recommend too many trees to the acre.

On small trees it is practical to control the insects by spraying with any arsenical solution, or gathering the larvae by hand when they are small, at which time they are inclined to feed in colonies. Large trees are also infested and when they grow singly as was observed in several places where the catalpa was used for lawn shade. For a few trees of large size, spraying may be done, but it is impractical in large groves. Cultivation of the soil about the trees when the moth is passing the pupa stage in the ground may be a means of holding the pest in check.

Much osage orange has formerly been grown for hedge fences throughout the county and in most cases the plants were not properly pruned and many have grown to tree size and much of the new growth has escaped into the fields and roadways. Many of the farmers are now cutting out the hedges, or rather grubbing out in order to remove the whole plant to stop further growth. It was found that the hedge plants used much of the moisture from the soil and that when they were planted about fields the crop for ten to twenty feet was cut short by lack of moisture and by shading. Some osage orange fences which have had proper pruning are very attractive. No new plantings are now put out. Where it is desired to have a border about lawns and gardens, various varieties of the privet are used. It makes a very pretty growth but is not very hardy.

Poole wheat grows well but does not give as good yields as when first introduced. The Fulse variety has almost played out on many of the soils but some farmers still obtain good yields and hold to it as the best variety. The farmers in general believe that it would be well to try a new variety. The yield of wheat per acre varies from 10 to 15 bushels with occasional yields of 30 to 40 bushels.

Some commercial fertilizer is used throughout the county, usually without any reference to crop or soil, the same kind being applied for wheat, corn and potatoes. Various brands are used

and most of the farmers are realizing some profit from the use of commercial fertilizer.

Considerable rye is used as fertilizer. It is usually sown in corn in the fall and then pastured in the early winter, then allowed to make a good growth in the spring, then again pastured and later plowed under. Corn is thus grown upon the same ground year after year. This is not as advisable as rotation, for more than two years, and many farmers doubt the value of rye as a green fertilizer.

Tomatoes are grown for canning factories at Center Point, Clay City, Brazil and Terre Haute. In the vicinity of Cory, about 200 acres are grown for the Terre Haute Canning Company. The yield is from three to seven tons per acre and the grower receives $7.00 to $7.50 per ton delivered. The tomatoes are hauled to Terre Haute by wagons. The upland soils are well adapted to tomato growing and this should prove to be a paying industry. An effort should be made to have the factories run the entire year, canning corn, peas, tomatoes, beets, sweet potatoes, beans, pumpkin and hominy. In the central part of the county those growing tomatoes for the Brazil plant are paid $7.00 per ton delivered at their nearest railroad station.

Just as the coal and clay industries have been and are at present the great enterprises of the county, so agriculture must be advanced to meet the demands and growth of the county. The soil conditions of the county should be carefully studied and continued investigation made as to their needs. The diversity of crops which can be grown, the natural productiveness of the land, the transportation facilities, the nearness to good markets and the development of the natural resources, coal and clay, all tend to make the area of this survey one of the most prosperous sections of the State.

KNOX COUNTY.

History of Settlement and Agricultural Development.

Knox County is the oldest county in the State. It has been called the "Mother of Indiana Counties." Its organization dates back to a period before the territorial government and finds a place among the earliest acts of the Government formed from the territory northwest of the Ohio River. Its original boundaries extended from the Ohio River to the lakes, including the State of Michigan, and from the Wabash River to near the middle of the State.

The original Knox County was established in 1790. In 1798 Wayne County was formed with Detroit as the county seat and comprising a greater part of Michigan and northern Indiana. By an act of Congress passed in 1800, the territory embraced in these States was divided into two territories with Vincennes the seat of one and William Henry Harrison as its Governor. In 1802 Clarke and Randolph counties were formed and in 1805 Dearborn County was added. Late the same year Michigan was made a separate territory and a part of Illinois which was included in Knox County was made a distinct territory in 1809. At this date there were only four counties in Indiana Territory, Knox, Clarke, Dearborn, Harrison. In 1810 Jefferson and Franklin counties were established, and in 1813 Gibson and Warrick were organized. Sullivan was added in 1817, and Greene in 1820, thus reducing Knox to its present size. The county was named in honor of General Knox, Secretary of War.

Vincennes, the county seat, is one of the oldest and possibly the oldest settlements in the State of Indiana. It is situated on the banks of the Wabash 57 miles south of Terre Haute. It was at this point that the French Jesuit missionaries from Canada said mass before astonished savages in the year 1702. This act may be regarded as the very beginning of French civilization in Indiana, although missionaries had visited the territory during the fifteen years preceding, and Robert D. LaSalle passed through it on the old Wabash and Maumee route and erected some stockades in 1680. There was, however, no permanent mission founded within the limits of the State until 1702. This was one year after the establishment of Detroit by La Molle Cadillac, and the French records show that the missionaries came from that part. Three years later, in 1775, the date when the French fort at Ft. Wayne was erected, a French trading post and stockade were established at Vincennes. Thus Ft. Wayne and Vincennes are on an equality

as to antiquity. There was not any considerable settlement about Post Vincennes until 1745. There are no authoritative records concerning the settlement for a number of years, down to 1749, other than the Government records at Quebec. Vincennes was the seat of government for the Indiana Territory until the removal of the capitol to Corydon in 1813. The place was first known as a Piankeshau village by the name of Chippe Coke, or Brushwood. It was also called Post Vincennes, or Au. Post Vinsenne, and finally Vincennes. The latter name was adopted as early as 1749, in honor of F. M. De Vincennes, a gallant French officer who was killed in battle with the Chickasaws in 1836. In 1850 the town had a population of 2,000.

The following paragraph, quoted from the reports of the Bureau of Statistics for 1909 and 1910, shows the present condition of Vincennes.

"Vincennes, city, population 1910, 14,895, increase of 4,646 over 1900; county seat, on B. & O. S. W.; E. & T. H.; C., C., C. & St. L. and the Vandalia Railroad; 9 rural routes; Adams, U S. and American Express, Western Union and Postal Telegraph, Bell and Independent telephone; 3 daily and four weekly newspapers; 3 miles of sewer; 7 public schools employing 82 teachers, 3 parochial schools, college, 15 churches, 20 lodges, 3 national banks, State bank, trust and savings bank, 5 building and loan associations, business men's association and commercial club; agricultural and implement factory, 6 bakeries, brewery, 2 brick and tile mills, canning factory, 2 cigar factories, two distilleries, 3 flour and grist mills, furniture factory, 3 planing mills, 2 saw mills, sewer pipe factory, 3 glass factories, 2 paper mills and rolling mill; 20 physicians, 15 dentists, 3 veterinary surgeons and 25 lawyers, 2 department, 5 dry goods, 6 shoe, 11 drug, 58 grocery, and 9 hardware stores; 3 laundries, hospital, 12 hotels; estimated number of employes in manufacturing plants, 3,000; estimated weekly payroll, $65,000; 72 saloons.

In commercial bodies, Vincennes has a board of trade and a merchants' and manufacturers' association. The output of factories includes brass, iron, sewer pipe, bar iron, paper, straw-board, milling products, beer, whisky, egg cases boxes, barrels, automobiles, fire apparatus, stoves and ranges, furniture, iron bridges, agricultural implements, brick and concrete blocks. The raw materials available are clay, sand, timber, coal and oil. The Board of Trade will give financial aid to new industries and has more than 200 acres

of land which will be given for factory sites. Vincennes is a good location for any kind of factory, as the shipping facilities are excellent and fuel can be obtained at a very low rate."

Bicknell is located 15 miles northeast of Vincennes on the I. & V. Railroad and was incorporated as a town in 1907. It was originally laid out in 1869 by John Bicknell, for whom it was named. In 1900 the population was 510; at the present time it is a little over 4,000. The rapid growth of the town is due to the recent development of the coal industry. There are six large mines in operation. The thickness of the veins being worked is from five to eight feet. Other veins of good thickness also occur in the same field. The mines are all well equipped. There are good opportunities for factories which would utilize the clays and shales from the mines. The other industries of the town are a flour and grist mill, planing mill, lumber yard, and about 50 stores of various kinds, and most of them are good in the line. Two rural routes go out from the town. The number employed in manufacturing plants and mines is about 900, with a weekly payroll of $16,500.

The town has made a very rapid and substantial growth. The development and progress of the town is very well assured. The coal field has an inexhaustible supply, good clay and shale is abundant, water resources are good, and the agricultural region surrounding is such that when properly developed would support a very large population. The merchants' associatoin is anxious to secure new enterprises and assistance will be given to any industry seeking such a location.

Sandborn is in the northeast corner of the county, 25 miles from Vincennes, on the Vandalia Railroad. It has two rural routes. The population is about 500. The principal industries are flour and grist mill, a sawmill, lumber supplies, blacksmith shop and grain elevator. There are two banks, two general stores, one drug store, jewelry, books and stationery, millinery, two hardware stores, and a harness shop. The town is a good shipping point for grain and stock. The soil of the immediate vicinity is a sand and sandy loam. It is fertile and produces good crops. The town would be a good location for a canning factory, and any industry seeking location here will be assisted by the town.

Edwardsport, the oldest town in Vigo Township, is located in the northeastern side of the county, on a bluff along White River; has a population of 675. The town was incorporated in 1869. It was a very active place until the growth of Bicknell began. It is on the I. & V. Railroad. The town is surrounded by a very rich

agricultural region, which is for the most part well improved. It is a good trading center and shipping point.

Westphalia is a German settlement, four miles northeast of Edwardsport. The population is about 85.

Freelandsville, in the northern central part of the county, is the only town in Widner Township. The population is about 600. The industries are a milling company, tile and brick plant, lumber and planing mill, also manufacturing lawn and porch swings and settees, a saw will and several good stores. The population is largely German. The town receives produce and business from a large area of the northern part of the county.

Oaktown has a population of 608. It lies 15 miles north of Vincennes and is on the E. & T. H. Railroad; has three rural routes, weekly newspaper, public school employing 9 teachers, 3 churches, State bank, flour and grist mill, 2 concrete block factories, 1 department, 2 dry goods, 3 grocery, 3 drug and 2 hardware stores, harness shop, building material, 2 livery stables, garage, hotel, 3 restaurants 2 barber shops, theater, 2 meat markets, 2 blacksmith shops, and repair shop. The town is situated in the center of a good agricultural region. It is a good residence town and is making a considerable growth as a home town.

Wheatland is 12 miles east of Vincennes, on the B. & O. Railroad. It has 415 inhabitants and, as its name suggests, is in the heart of a rich wheat growing area.

Bruceville has 366 inhabitants, is on the I. & V. Railroad, and is called "Boston of Knox County." It was here that the first wool carding mill in Knox County was built in 1820. An oil mill for extracting fluids from castor beans, a distillery and an ox-tread mill were then in operation. It is a good little village and receives considerable trade from the northern part of the county. An excellent new school building has just been completed.

Monroe City has a population of 630, is 12 miles southeast of Vincennes, has a rural route, public school with 6 teachers, 3 churches and a State bank, 8 physicians and a veterinary, 4 groceries, 3 general stores and a drug store, bakery and two sawmills. It is in a good agricultural region.

Other towns worthy of mention are Fritchton, Purcells, Emison, and Busseron.

Grants, Donations and Surveys.—A large part of Knox County was divided by the general government into militia donations, locations and surveys. These surveys were made between 1794 and 1802. The land was given for military service, claims against the

Government and as grants for settlements. The remainder of the county was later laid out in sections by the rectangular system of survey in 1801 and later. In the portion of the county divided into surveys and donations, the dividing lines run in most cases northeast and southwest and northwest and southeast, though in some cases they are irregular. The description of the land divides is given fully under Sullivan County. Some additional information is here given to show the manner in which the title to lands was secured and the desire of the early settlers to secure the land.

Laws were passed by Congress for disposing of lands in the western territory and for prohibiting settlement of unappropriated lands by reckless speculators. Land speculation on the border of the Ohio and Wabash Rivers was exciting considerable attention and large land companies were organized for the purpose of monopolizing the trade. Tracts of millions of acres were sold at one time by Congress, and so far as the Indian titles could be disposed of, the work of settling and improving the land began.

Governor St. Clair intrusted the secretary of the territory, Winthrop Sargent, with the execution of the resolutions of Congress regarding the lands and settlers on the Wabash. He directed that officer to proceed to Vincennes, lay out a county there, establish the militia, and appoint the necessary civil and military officers. Mr. Sargent at once proceeded to Vincennes, where he organized the Camp of Knox, appointed the necessary civil and military officers, and notified the inhabitants to present their claims to lands. In establishing these claims the settlers found great difficulty, and regarding it the secretary in his report to the President remarked:

"Although the lands and lots which were awarded to the inhabitants appeared from very good oral testimony to belong to those persons to whom they were awarded, either by original grant, purchase, or inheritance, yet there was scarcely one case in twenty where the title was complete, owing to the desultory manner in which public business had been transacted and some other unfortunate causes. The original concessions by the French and British commandants were generally made upon a small scrap of paper which it has been customary to lodge in the notary's office, who has seldom kept any book of record, but committed the most important land concerns to loose sheets, which in process of time have come into possession of persons that have fraudulently destroyed them, or, unacquainted with their consequences, innocently lost or trifled them away; for by the French usage they are considered as family inheritances and often descend to women and children. In

one instance, and during the government of Mr. St. Augehere, the royal notary run off with all the public papers in his possession as by certificate produced to me. And I am very sorry further to observe that in the office of Mr. LaGrand, which continued from the year 1777 to 1787, and where should have been the vouchers for important land transactions, the records have been so falsified and there has been such gross fraud in forgery as to eradicate all evidence and information which I might have otherwise acquired from his papers."

Winthrop Sargent informs us that there are about 150 French families at Vincennes in 1790. The heads of these families had all been at some time vested with certain titles to a portion of the soil, and while the secretary was busily engaged endeavoring to straighten out these claims he received a petition signed by 80 Americans praying for the confirmation of the grants of lands ceded by the courts which had been organized by Colonel John Todd, under the authority of Virginia, to which reference has already been made. This case was met in the action of Congress on March 3, 1791, empowering the Governor of a territory in cases where land had been actually improved and cultivated under a supposed grant for the same to confirm to persons who had made such improvements. The land supposed to have been granted not, however, exceeding the quantity of 400 acres to any one person.

Transportation Facilities.—The railway facilities of the county are very good. The B. & O. S. W. crosses from east to west near the center; the E. & T. H. from north to south through the western part; the I. & V. and the Cairo Division of the Big Four crosses from northeast to southwest. All converge at Vincennes and give good facilities for the location of a manufacturing center of importance. An interurban line from Vincennes to Washington is under construction. Both White River and the Wabash have been used for the transportation of products by rafts, flatboats, small steamers. It is probable that streams, and especially the Wabash, may in the future be made navigable. In the early days the stage lines from Evansville to Vincennes and Terre Haute carried many passengers.

The county has 580 miles of public road, with more than 300 miles improved. The improvement has been chiefly with gravel. The average original cost of the gravel road per mile is about $1,800, for the stone road about $2,000. The first improved roads were built in 1900. Along the Wabash there are several gravel pits opened in the vicinity of Emison, and to the south of Vin-

cennes is considerable terrace gravel, but in the White River valley gravel is very scarce. Stone suitable for road metal is very scarce and cannot be produced as cheaply as other stone can be imported.

Agricultural Societies.—In 1809 Knox County boasted of its agricultural societies, the object of which was "To encourage domestic products." However, the society did not hold but one meeting. In 1826 a similar institution was formed and kept going for several years, until the Legislature made provision for the commissioners to aid such organization. A third organization was formed under the new ruling, which had existence from 1836 to 1856. Although appropriations were made during the first three years of the organization, there is no record of any fair being held before 1855. However, this one is referred to as "the fifth annual fair." It was held at the court house. In 1856 the sixth fair was held near Vincennes. Two hundred dollars were paid out for premiums, but there yet remained over $4,000 in the treasury, over which much dissatisfaction arose as to who should be its custodian. This finally led to the disorganization of the concern. In 1858 James D. Williams formed another agricultural and mechanical society, which held its initial meeting October 28, 29, and 30 of that year, as a district fair, at which Gibson, Warrick, Pike, Sullivan and Lawrence County, Illinois, all had exhibits. Louisville, Kentucky, and Evansville, Indiana, each had displays among a thousand or more entries. This fair was a great success, but after the next year it passed out of existence and was not revived until 1871, when the present Knox County Agricultural and Mechanical Society was organized. The society added to its possessions from year to year and now controls an immense tract of valuable land bordering on the northwest limits of the city.

General.

The population of Knox County was 6,557 in 1830. By 1850 it had almost doubled, and by 1910 it had reached 39,183. The county has an area of 510 square miles. The total farm area is 305,966 acres, with 249,603 acres improved. The average selling price is from $75 to $100 per acre. It ranks third in acreage of corn and wheat, first in acreage of peas, watermelons and cantaloupes. In number of mules sold it stands second in the State.

Knox County produces annually about 900,000 bushels of wheat, which averages from 15 to 18 bushels per acre; corn yields about 2,900,000 bushels each year, with from 30 to 40 bushels per acre;

yield of oats is about 175,000 bushels, averaging from 20 to 40 bushels per acre; rye is grown on about 340 acres, yielding from 7 to 12 bushels per acre; timothy is raised on about 12,000 acres, making more than a ton per acre; alfalfa produces from three to eight tons per acre, but is not grown on but about 550 acres; prairie grass is grown on from 100 to 200 acres, yielding about one and one-fourth tons per acre; clover yields from one to one and a half tons per acre on an acreage of about 7,000 acres. Potatoes yield from 75 to 80 bushels per acre, with more than 300 acres each year; onions are grown for market on about 25 acres, averaging from 60 to 70 bushels per acre; tomatoes yield from 2 to 10 tons per acre, and are grown on from 150 to 200 acres each year. The acreage of peas is about 4,000 acres; watermelons, 2,000; cantaloupes, 250 to 300 acres; berries are raised on from 10 to 20 acres, yielding from 25 to 35 bushels per acre; tobacco yields about 100 pounds per acre, but only five or six acres are put out annually. Quite a number of horses, cattle, hogs and sheep, but more specially mules, are sold each year. Poultry raising is not engaged in extensively.

"Nature, science and wealth have combined to make industrial farming in the community a calling out of which the producer not only gets big production, but which enables him to follow his vocation with profit and pleasure. The wonderful possibilities of scientific agriculture in this region cannot be exaggerated. The unprecedented crop yields are so enormous as to seem incredible to one not acquainted with the topography of the country, the climatic influences of river vapors on vegetation and the adaptability of the soil for their advantageous assimilation. One reason why farms in this section are so attractive and productive is because they are nearly all owned by the men who till them. Diversified farming is quite extensively carried on, and as a producer of cereals, all kinds of grain and every known variety of vegetable and fruit, the soil of Knox County is exceptionally fine. Especially in the production of corn, oats, wheat, clover, rye, timothy, potatoes, tomatoes, apples, peaches, pears, plums, grapes, strawberries, etc., is this true. Alfalfa, the staple crop of Kansas, Washington, Oklahoma and Texas, can be raised in many sections of the county where the ground has been properly fertilized, almost as well as in any of the States named, as has been demonstrated by William H. Brevoort, one of the largest land owners in the county, by practical experiments on several of his farms just below the city limits. Live stock farming, too, can be and is profitably carried on here to a large extent.

The natural water courses running through and the smaller streams traversing or lying within the confines of the farming districts and the excellent quality of grass for grazing purposes which grows abundantly far into the winter months and remains green and nutritious almost the year round are advantages which make the business at once inviting, pleasurable and profitable. Cattle, sheep, hogs and poultry are raised in unlimited quantities in Knox County, and for all of them there is always a ready home market. Some of the finest bred stock to be found in the county is raised in the pastures and on the fields adjacent to Vincennes.

"And when it comes to melons, the growers of this luscious fruit have the pumpkin growers decidedly outclassed. The industry of melon growing in Knox County has attained gigantic proportions. The quantity of the watermelons and cantaloupes produced in this county, all of which are of superior quality, is so great that when the crops are gathered the shippers frequently find it difficult to secure cars sufficient for their transportation. The Rocky Ford melons of this vicinity are prime favorites with the epicures of New York City, and the swell clubs and cafes of the eastern metropolis have acquired the habit of underlining on their menu cards 'Knox County nutmegs,' for which they receive handsome prices. The north and east are large consumers of the melons grown in this locality, and the railway stations at Vincennes, Decker, Purcell, Oaktown, Emison, Bicknell, Edwardsport and Wheatland are scenes of unusual activity when the melon season is on. The profits which accrue from the cultivation of melons are said to be enormous, amounting in the aggregate to more money in proportion to the time and labor expended and the extent of acreage cultivated than can be realized from the yield of any other product. And the industry, it might be said, is still in its infancy.

"Knox County has almost as many varieties of soil as the products thereof. The highlands are abundantly rich and mellow, adapted to the culture of any crop, and conform admirably to every kind of farm uses. The vast expanse of bottom lands which skirt the Wabash, White and Duchee rivers is especially adapted to corn, wheat and hay, which yield large crops during seasons of severest draught when vegetation in other localities withers and dies from lack of moisture. There is really nothing which grows to sustain life of man or beast that cannot be raised in abundance in this section with less labor and less cost than the same can be produced elsewhere. The unexcelled railway facilities which enable the farmer to get to any market he desires without having to

see a middleman, the excellent system of gravel roads that penetrates the very heart of the farming country, maintained in fine condition the year round, are advantages which are not to be given secondary consideration in summing up the various conveniences of living 'down on the farm.' The rural free delivery of the mail to all sections and the service of two complete telephone systems, one of which is the product of home capital and enterprise, are other essentials not to be lightly considered in contemplating the advantages enjoyed by the farming community.

"The unrivaled agricultural resources of the county of which Vincennes is the seat of government have not only sustained but have built up the thriving city. Some of the wealthiest citizens, in fact many are or have been, owners of farms from which they derived their wealth. These men have kept pace with every advance step made in the direction of progressive agriculture. While none of them are farmers in the literal sense, nearly all own farms and personally look after the cultivation of them, for the reason that the industry of farming in this locality especially is considered a science as well as a profession, besides an interesting study, an interesting vocation, and has been to them the royal road to wealth. The major part of all farming land in the county (with the exception of localities where mounds and hills occur) is generally level or gently rolling with sufficient slope to afford first-class drainage, and so smooth that it will admit the passage of automobiles over its surface with comparative ease. It has few waste places to be made green, for the reason that nearly every acre of it is in cultivation or covered with a growth of valuable forest trees. Farm life here is made pleasant as well as profitable by congenial surroundings which unite a people in bonds of mutual interest and make a community of happy homes. The progress of the farming communities in this section has kept pace with the progress of the world. The farmers hereabout know what constitutes scientific farming and evidently possessed this knowledge before the study of agriculture was taught as a science in the advanced institutions of learning, for fortunes large and small have long since been gathered by them from the fruits of the soil. And yet there are no wild speculations here growing out of the sale of desirable farms like there are in other localities where undesirable farms are sold, in the so-called virile and growing West where land values as well as the land itself are fictitious. The best farms are bought and sold here for the best prices and the purchasers hail principally from the West, while not a few are from the East or

North. The unsurpassed fertility of soil, a climate adapted to the highest crop production and comfortable for human habitation, social, religious and educational advantages such as are afforded by up-to-date schools and churches; the number of good sized towns in proximity to the farms; and the splendid markets furnished by Vincennes for everything raised on a farm; a pleasing rural landscape, the beauties of which never become monotonous, but are always pleasing and refreshing, are a few of the manifold features having magnetic power to bring to this locality people who are seeking agricultural districts for agreeable homes and a comfortable competence. Good farms can be had as low as $30 and as high as $300 per acre.

"In proportion to the area of territory she occupies, Knox County raises a greater quantity of wheat and corn than any other county in the State, the average yield of the acres in actual cultivation being greater than that of any other county. It is not a very uncommon thing in favorable seasons to gather 85, 95 and even 110 bushels of corn from one acre of ground. On a farm two seasons ago, a sixty-acre farm within two miles of Vincennes totaled over 100 bushels of corn per acre. Conditions of soil and climate are very favorable to wheat raising, and from 45 to 53 bushels of this cereal to the acre is not considered as an extraordinary yield when the harvest days have been preceded by a season of winter weather conducive to the health and growth of the tender plant. Other crops fare as well and yield as abundantly here as hay, corn and wheat. The atmospheric conditions of the locality and the chemical formations in the soil arising from the alluvial deposits of the streams and from other causes characteristic of this region are responsible for the wonderful productiveness of the soil.

"Notwithstanding the ground in nearly all the farming districts has been worked more or less for years there are evidences of unanalyzed agents in the air and the earth which impart to uncultivated land elements of fertility and productiveness equal to that possessed by virgin soils in the less favored localities. Hence all products yield here abundantly, and the time and cost of fertilizing the land are materially lessened on account of these favorable conditions.

"The soil of Knox County is adapted to horticulture as well as agriculture. An impressive illustration of this can be had in a visit to the beautiful nursery farm of either Mr. Simpson or Mr. Reed, which adjoin each other and are located about three and a half miles southeast of the city, where flowers, trees and shrubs,

natives of almost every clime under the sun grow profusely and are attractive features of two of the handsomest country homes anyone having a taste for beauties of landscape gardening or artistic architecture could wish for. The adaptability of the soil for flower culture has been demonstrated by W. A. Reiman, florist, who grows every year from 300,000 to 500,000 effusions of white, crimson and pink peonies from an open field of 12½ acres in one of the rich agricultural localities of the country. This wilderness of floral beauty is located about four miles northeast of Vincennes, and all lovers of nature as developed in flowers who have never seen them can form no adequate conception of its rarity and loveliness."

Physiography and Geology.

Topography.—Knox County is bounded on three sides by rivers, on the west by the Wabash and on the south and east by White River. The outline of the county is very irregular. The surface is generally level or gently undulating and in a few places becomes quite hilly. Lying between the two rivers, the slopes are short and gentle, so that no large streams occur. The county is practically all covered with the Pleistocene deposits. In the valleys the thickness runs up to 100 feet and in some of the old valleys which have not been changed, may exceed that. On the uplands the surface will not exceed 50 feet and in many places is not more than 5 to 10 feet.

The upper or barren Coal Measures form the surface rocks of the greater part of the county. The lower or productive Coal Measures underlie the whole county, but the veins of coal are so deep that they are at present being worked only in the eastern part. The upper Coal Measures are made up of alternating sandstones and shales with occasionally thin beds of "rash" coals of no economic value. The total thickness of these formations is more than 300 feet. The workable veins of coal in the county vary from three feet to more than seven. The coals underlying Knox County are from No. V to No. IX. Coal V is just at river level at Edwardsport. It is above river level at the mouth of the west fork of White River and on White River above Edwardsport. At Appraw Ford, Coal VII is down to the level of low water of White River, indicating a broad syncline from east to west in the center of the county on the eastern edge. At the northeast corner of the county the coals below No. V outcrop, so that Voal V is rising in that part of the county. Coal VI outcrops in the eastern half of R. 8 W. and VII a little distance west. The coals always have a westward dip.

Round-top hills rising on the eastern border of the Wabash Valley near Smith's Station north of Old Fort Knox, Knox County.

Wabash River, as viewed from the site of Old Fort Knox, Knox County, Ind.

At Vincennes, Coal VI is only 35 feet above sea level, or at a depth of about 400 feet, and the other coals will be found at a correspondingly greater depth. Some of the best equipped mines in the State are in this county, and the production of coal is rapidly on the increase. Present estimates would show the amount of workable coal yet remaining in the county to be more than 2,000,000,000 tons.

Drainage.—The divide between White and Wabash River extends through the center of the county, the western half being drained in the Wabash by Busseron and Marie creeks and Deshee River and smaller tributaries. The eastern half drains into the west fork of White River through Black Water, Indian and Pond creeks. The two forks of White River unite at the southeastern corner of the county and White River and the Wabash unite at the southwestern corner of the county. Several old streams and bayous occur in the river bottoms, forming marshes. Most of these marshes have been reclaimed by artificial drainage. In the southwest corner of the county, several ditches have been constructed, generally with good results. In the vicinity of Decker, about 4,000 acres have been reclaimed by the completion of the Plass Ditch in 1907. The ditch runs through six miles of what was the least valuable land in Knox County. About 25,000 acres near the swamp was also increased in value by this ditch. It cost the owners of the land affected about $60,000. The value to Knox County will result in at least $200,000. In addition to the drainage of the large tract of land, the ditch robbed the Wabash River of one of its main tributaries, the Deshee River. Before the ditch was constructed, the river emptied into the Wabash a few miles above Mt. Carmel, Illinois. Now the stream empties into White River, using the ditch for its channel for six miles of its course. Before the completion of the ditch, the Deshee River was the only outlet for these swamp lands, but the river failed to do its work and the swamp spread out over a wide area.

The Wabash River has been leveed along a considerable part of its course and the bottoms are fairly well protected. In the White River bottom, much tile drainage is being put in and the soil is in excellent condition.

Geological Section.—The following sections will show the thickness of the soil and the character of the geological formations.

Section East of Vincennes on Upper Prairie Survey No. 10.

	Feet.	Inches.
Surface soil, Vincennes plain	3	0
Merom rock, sandstone	45	0
Coal	0	3
Sandstone	2	6
Soft clay shale	14	8
Coal	0	2
Clay shale	15	0
Sandstone	10	0
Soft stone	0	10
Hard limestone	10	5
Black shale	5	0
Soft stone	18	0
Sandstone	50	5
Sandstone, soft	10	3
Coal	0	8
Fire clay	2	10
Total	189	0

Section of Bore at Oaktown.

	Feet.	Inches.
Surface	30	0
Sandstone	17	4
Coal	0	4
Fire clay	2	6
Limestone	3	4
Fire clay	10	6
Shale and iron ore	13	10
Black shale and coal	6	0
Clay shale	7	8
Limestone	10	0
Clay shale	3	7
Fire clay	5	0
Sandstone	6	6
Gray shale	2	0
Limestone	12	0
Gray limestone	4	0
Sandstone and gravel	4	2
Sandstone	2	4
Limestone	1	5
Gray limestone	7	0
Limestone	1	5
Shale and iron ore	6	7
Limestone	1	8
Clay shale	9	8
Iron ore	1	2
Clay shale	1	8
Blue limestone	6	0

	Feet.	Inches.
Clay and shale	8	6
Gray limestone	12	8
Gray shale	5	6
Limestone	9	0
Gray shale	23	0
Total	236	4

Section One and One-fourth Miles North of Edwardsport, N. E. Quarter Section 36 (5 N., 8 W.).

	Feet.	Inches.
Soil and drift clay	12	0
Blue sandy shale	10	0
Coal VII	3	2
Under clay	3	4
Blue clayey shale	39	0
Dark bituminous shale	3	0
Coal VI	5	3
Under clay	2	0
Total	77	9

Section of Old Mine Shaft Near Monroe City, Donation #28.

	Feet.	Inches.
Surface clay	12	0
Quicksand	7	0
Blue clay	55	0
"Concrete rock"	4	0
Coal	4	0
Bone coal	1	0
Fire clay	1	0
Sandstone	50	0
Coal	1	2
Total	135	2

SOILS.

The soils of the county present a great variety of types. The two great divisions are the uplands and the river bottoms. The county is one of the most fertile in the State. The broad valleys of the streams form the large portion of the surface and greatly increase the average thickness of the soil. The flood plains of the river are from one to more than three miles wide. Extensive terraces also occur. The bottom clays are chiefly clays and clay loams, grading in places into fine sandy loam. The sandhills and sand plains or terraces are extensive and very fertile. These sandy soils have placed Knox County in the lead in the production of melons

in the State. The main type of the upland soil is the Knox silt loam, formed from the drift and loess of glacial origin. The following table gives the names of the various soil types and the area occupied by each:

	Sq. Mi.
Knox silt loam	200
Wabash silt loam	113
Sioux sandy loam	65
Knox sand	45
Sandy clay loam	34
Mode silt loam	30
Clyde sand	7
Clyde clay	5
Knox sandy loam	3
Muck and peat	3
Fargo clay	2
Marl loess	2
Wabash clay loam	1
Total	510

Knox Silt Loam.

The Knox silt loam and the modified Knox silt loam are the chief soils of the uplands. These soils have been fully described in the reports on the counties given in the preceding pages, to which the reader is referred.

In Knox County the upland soils are in general more fertile and better adapted to agricultural conditions than the same soils in the other counties to the north. They contain a higher percentage of fine silt, and in the western part, along the bluffs of the river, are pure loess soils. Exposures along the bluffs show the characteristic features of loess material, and the surface of cultivated fields show the loose, floury texture. The great central area of the county consists of the Knox silt loam.

The topography of the area of these types is gently rolling to hilly. In general, the hills are low and rounded, with gently sloping sides. In the true Knox silt loam areas the drainage is good, but in the areas of the modified silt loam the drainage is rather poor, or has been in times past. The former type is the light gray to yellow soil; the latter is from light to white in color. The texture, size of grain, etc., is practically the same in both soils, the separation being made on color and drainage conditions. The soil overlies beds of sandstone and shale which outcrop in many places along the river valleys and the stream beds. These rocks, however,

have not entered into the composition of the soils except in a very limited way in some localities.

These soils are adapted to all of the general farm crops and to many special crops. Wheat and oats both give good yields, the wheat yielding on the average from 12 to 20 bushels per acre, and a large acreage is grown. Corn grows well but does not give as good yields as on the Sioux sandy loam. In the summer of 1911, however, the upland silt loam types gave much better yields than the prairies because of the excessive dry weather, the close compact nature of these soils being more retentive of moisture than those with the gravelly subsoil. Considerable fertilizer is used and with good results. A large acreage of clover, timothy and other grains are grown and give good yields.

In most places the soils show faintly acid to strong acid reaction, and attention should be given to this fact. Lime is used on a few farms and the results obtained have been very satisfactory.

Many small dairy herds are kept, and on these farms the soils are in excellent condition. Some alfalfa is grown. Apples, peaches, plums and other fruits are successfully grown. Truck farming is carried on to some extent and all the special crops give good yields.

In some parts it is necessary to exercise considerable care to prevent washing. This can be prevented by not breaking the surface too near the edge of the hills and gullies, and by using means to check the growth of washes which have been started. The margins of the hills and ravines are excellent places for the planting of forest trees, both for the value of the tree growth and the protection afforded the soil by the roots.

The folowing table shows the result of mechanical analyses of the silt loam soils:

Locality.	Description.	Fine Gravel, Per Cent.	Coarse Sand, Per Cent.	Medium Sand, Per Cent.	Fine Sand, Per Cent.	Very Fine Sand, Per Cent.	Silt, Per Cent.	Clay, Per Cent.
Boyd Farm S. ¼ N. ½ Don. 46	Surface	0.5	0.5	0.4	1.5	4.0	82.5	11.8
N. ½ Don. 47	Subsoil 8 in. -20 in.	0.2	0.4	0.5	0.5	8.2	80.5	10.
N. ½ Don. 47	Subsoil 20 in.-72 in.	0.5	0.8	0.5	0.5	6.2	78.5	13.
Emison Farm: S. W. Bruceville	Surface 8 in.	4.0	1.5	0.7	0.5	6.0	70.8	16+
Alton Farm N. W. Bruceville	Surface 8 in.	0.5	0.8	1.2	0.8	7.5	81.4	8+
Near Monroe City	Surface 12 in.	0.4	1.0	0.6	1.5	6.5	78.5	11+

Note.—In the first three samples given in the table the surface was taken in wheat field. The soil was a typical loose, brown, fer-

tile soil. The subsoil 8″-20″ was taken in a vertical exposure, was uniform brown in color, and contained a small amount of fine grit. The corn in adjacent field yielded about 65 bushels per acre. The subsoil 20″-72″ was a stiff, compact loess clay, uniform brown in color. In some places the subsoil is mottled with white. The sample taken on Emison farm was in corn field and contained many irony pebbles known as "hen gravel," due to former poor drainage conditions. The field is well kept up by manure and clover. The sample from the Alton farm was taken in a wheat stubble field. The farm has been rented for a number of years and not much humus is left in the soil. In places some gravel is found on the surface, but in general the soil is not in bad condition for a soil so destitute of organic content. This soil can easily be brought to a good state of tilth and crop production. The sample near Monroe City was taken in a wheat field which had made a good yield in the present season. The soil was in a good state of tilth and of good uniform color.

Chemical Analyses of Knox Silt Loam.

The folowing analyses were made for a mixed sample of the typical silt loam taken at several locations.

Collector, Shannon.
Chemist, Blanchard.

Description	Surface 8 in.
Reaction to litmus	Neutral
Moisture at 105° C. from air-dried soil	1.62%
Total soil nitrogen	0.150%

Analysis of fine earth dried at 105° C.—

Volatile and organic matter	5.19%
Insoluble in 1.115 HCl	84.99%
Soluble silica ($S:O_2$)	0.11%
Ferric oxide (Fe_2O_3)	2.00%
Alumina (Al_2O_3)	5.41%
Phosphoric acid anhydride (P_2O_5)	0.19%
Sulphuric acid anhydride (SO_3)	0.07%
Calcium oxide (CaO)	1.27%
Magnesium oxide (MgO)	0.80%
Potassium oxide (K_2O)	0.23%
Sodium oxide (Na_2O)	0.29%
Total	100.55%

Collector, Shannon.
Chemist, Blanchard.

Description	Subsoil
Reaction to litmus	Neutral
Moisture at 105° C. from air-dried soil	1.79%
Total soil nitrogen	0.104%

Analysis of fine earth dried at 105° C.—

Volatile and organic matter	4.10%
Insoluble in 1.115 HCl	84.86%
Soluble silica (SiO_2)	0.10%
Ferric oxide (Fe_2O_3)	2.66%
Alumina (Al_2O_3)	6.23%
Phosphoric acid anhydride (P_2O_5)	0.19%
Sulphuric acid anhydride (SO_3)	0.05%
Calcium oxide (CaO)	0.90%
Magnesium oxide (MgO)	0.81%
Potassium oxide (K_2O)	0.23%
Sodium oxide (Na_2O)	0.47%
Total	100.60%

Wabash Silt Loam.

The soils of the White River valley vary in character from silt loam and clay loam to fine sandy loam. The silt loam is the prevailing type. It contains from 15 to 20% of the finer grades of sand. It is of a light brown to dark brown color; it is of great depth and there is usually no marked line between the soil and subsoil. The subsoil in general is heavier and of a lighter color, at varying depths the subsoil grades into a fine sand or a sandy loam.

The type is strictly an alluvial soil of recent origin. The area is at times flooded, but as a rule only the lower parts are subject to overflow. In the earlier days of the agricultural development of the area the sediment left was much darker in color than at present, doubtless due to the greater quantity of organic matter contained in the virgin upland soils. In the areas where the type becomes more truly a fine sandy loam the color is somewhat lighter than in the silt loam. The greater the sand content the lighter the color. There is very little coarse sand. The upper part of the subsoil contains considerable fine material, but this decreases with depth, and at about three feet a fine sand of loose incoherent nature is often found.

The soils of the river bottom are very easily cultivated. They are not difficult to plow and will remain in good tilth during the

entire season. The bottoms were originally timbered. The principal timber growth consisted of walnut, sycamore, elm, ash, white oak, black oak, burr oak, chinquapin, sugar, red and river maple, hackberry, dogwood, redbud and wild cherry. At the present time scarcely any timber of size remains and in most places the land has been cleared down to the river's edge. In places a fringe of small growth has been left along the immediate banks. This is a very essential thing to the preservation of the soil. When the tree growth has been entirely removed slumping is always taking place along the river banks and large tracts of soil are destroyed every year.

Corn is the principal crop. The yield is from 40 to 75 bushels. In considerable parts of the area the farmers estimate that on the average from 15 to 30% of the crop is destroyed by flood, either early in the season by causing a poor stand, or by overflow before the crop is gathered. The corn yields made, however, are always fair to good. The white varieties of corn are grown almost exclusively. Cribs of large size are built over the area, and the corn is cribbed at times of gathering and marketed as controlled by slack times in farm work, condition of the roads, and the fluctuation of prices, much of the corn being kept in store until after the following wheat harvest. Timothy is grown to a considerable extent and makes good yields, but the meadow will not stand in the bottoms more than two years. They are also damaged by flood waters, carrying in large amounts of old weeds, corn stalks, etc., which injure the quality of the hay and the weed seed being distributed everywhere causes injurious weeds to spring up, choking out the timothy.

Clover does well and a large acreage is grown. The moisture retained in the soil is sufficient to give good yields even in the dry seasons. A large percentage of the acreage furnishes both hay and seed. The first crop is cut early and allows the seed crop plenty of time for maturing. In the summer of 1911, large fields of excellent crops of clover for seed were grown, while on the uplands the entire clover crop was almost an utter failure because of the drought.

Cowpeas are grown to some extent, but make such a rank growth that they are too coarse for feed and do not mature the peas. The crop is turned under for green manure.

Wheat does well and usually gives good yields. Several pieces on the area in 1911 made 30 bushels per acre, and some 40 bushels.

The average yield is from 15 to 20 bushels. Straw grows very heavy and often kills out clover sown in the wheat. A large acreage of ground is being plowed for the wheat crop of 1912. Fulse and Poole varieties are grown chiefly, and it is said that Fulse gives the best yield. Some oats are grown, but usually grows so rank that they fall before maturing and make the crop uncertain. Trumpet creepers and morning glories are very troublesome in the corn fields.

Knox Sandy Loam.

The soil occurs in the region about Sandborn. It is a sandy loam about 6 to 12 inches in depth. The color varies from gray to reddish brown or dark brown. It is composed of medium to fine sand containing a small percentage of silt and clay. The surface is characterized by low knobs and ridges, the result of wind deposition, and are to some extent still influenced by the shifting by the wind. The subsoil is a medium to coarse sand or sandy loam of a yellowish brown color. The clay content varies greatly. In general there is sufficient silt and clay in the subsoil to give a firm, stiff texture. In places the material is a loose, light gray sand, which is usually dry and coarser than the material above.

On the edges of the area near to the upland the soil grades gradually into the Knox silt loam. It is probable that the sand was derived from sediment land down along the streams and drifted to the present position by the wind. Some of the low and coarse areas may be due to water deposition, but the variable depth, the topography and distribution would indicate wind action as the chief agency in the formation. In the cultivated fields the surface bleaches to a dull gray or slightly reddish gray, but on the better improved parts the dark color is well kept up by the use of clover and peas to add organic matter to the soil. Although rather loose and incoherent, the soil retains moisture very well. The usual farm crops are grown and give fairly good yields, but is usually valued lower than the best parts of the upland silt loam and the soils of the bottoms. The soil is easily cultivated.

Corn produces well, and wheat gives good yields, but it is essential to keep up the requirements of the soil by frequent changes to clover or similar crops. It would be an excellent soil for truck gardening, and is especially adapted to melons, tomatoes, and small fruits. A canning factory established at Sandborn would be of much importance to the area covered by this type of soil.

Mechanical analyses show the following results:

Locality.	Description.	Fine Gravel, Per Cent.	Coarse Sand, Per Cent.	Medium Sand, Per Cent.	Fine Sand, Per Cent.	Very Fine Sand, Per Cent.	Silt and Clay Per Cent.
½ mile north of Sandborn.....	Surface 12 in.....	0.6	3.5	8.5	30.5	10.5	45+
1 mile South of Sandborn.....	Surface 12 in.....	0.5	4.0	10.5	25.4	10+	5[illegible]

Wabash Clay Loam.

Several small areas of this type occur over the county, the largest of which is to the northeast of Sandborn. In general, the areas are small and have not been mapped separately from other similar types. The soil consists of a light colored silty clay loam. The surface varies from a very light gray to a dull yellowish gray. The areas are in low lying situations difficult to drain. When wet, the soil is plastic, and upon drying has a tendency to break into cubical fragments. Usually the organic content is low, but in some places sufficient to give a dark color to the soil for a few inches in depth. On plowed fields the surface when dry has a very uniform light color.

The subsoil is a stiff silty clay, containing but a very small percentage of sand. The color varies from yellowish to almost white. Iron concretions are not so abundant as is usually the case in soils of like situation and similar color.

When well drained the soil is very productive and is easily cultivated. Corn is the principal crop; some wheat, oats and meadow are grown.

Soils of this type would be well suited for the production of pasture and heavy forage crops Care must be taken, however, to not remove too much of the organic matter from the soil

The mechanical analyses show the following results:

Location.	Description.	Fine Gravel, Per Cent.	Coarse Sand, Per Cent.	Medium Sand, Per Cent.	Fine Sand, Per Cent.	Very Fine Sand, Per Cent.	Silt and Clay, Per Cent.
North of Sandborn.....	Surface, 8 in.....	.05	2.5	2.0	13.5	15.5	65+
North of Sandborn.....	Subsoil, 8 in.-24 in.	.0	.5	1.5	8.0	10.0	80

Clyde Sandy Loam.

The Clyde sandy loam lies in the northeast corner of the county along the western border of the Wabash silt loam. On the west is the Knox sandy loam and the Knox silt loam. The soil lies along the immediate course of Black Creek.

It is a dark gray to black medium textured sandy loam, from 6 to 12 inches in depth. It is very loose and pliable, due to the high organic content and the high percentage of fine sand. The drainage is usually fairly good. The subsoil is a sandy loam of coarser texture and lighter color, which at greater depth becomes a mottled sandy clay, rather sticky. The surface is practically level, with few slight differences in elevation, which in places gives a gently rolling appearance.

This is a good soil for all the general farm crops. The principal crop is corn and the yield is from 50 to 80 bushels per acre. Wheat produces well. In the summer of 1911 a large acreage was being plowed for wheat. Oats grow well. The usual rotation is corn, oats, wheat, clover, and back to corn. Some farmers grow corn for several years in succession. The soil is naturally fertile, but the growing of successive corn crops depletes it very badly and the need for rotation is well shown. Clover grows well and yields well and most years a considerable acreage is grown. No commercial fertilizer is used. Some stock are raised, but chiefly only for farm use. It has been the habit to burn cornstalks to get rid of them, but at present other means are used, such as using cutters and harrows, and thus saving the stalk to be added to the soil.

The land of this area is valued at a good price and the farmers all consider this type of soil, when drainage conditions are good, as the best in this part of the county.

The following table shows the result of mechanical analyses of this type:

Location.	Description.	Fine Gravel, Per Cent.	Coarse Sand, Per Cent.	Medium Sand, Per Cent.	Fine Sand, Per Cent.	Very Fine Sand, Per Cent.	Silt, Per Cent.	Clay, Per Cent.
S. side Sec. 20 east of Sandborn.....	Surface 12 in.....	0.5	4.5	15.4	38.5	12.5	17.5	12.0
S. side Sec. 20 east of Sandborn.....	Subsoil 12 in.-24 in.	0.3	3.5	16.8	40.5	9.5	18.8	12—

Clyde Clay.

Bordering on the Clyde sandy loam and in scattering areas of small extent elsewhere is a type of soil which is a black, silty clay or clay loam, containing a high percentage of organic matter. On dry surfaces the soil is very granular, breaking into small cubical fragments. The surface soil is from 6 to 10 inches in depth. The

subsoil is a bluish or drab-colored clay, very tenacious, and practically impervious to water. This soil occurs in low-lying, poorly-drained areas. Timber growth seems to have always been very scanty on these areas, but the growth of grass and other moisture-loving plants has been very heavy. In places the soil becomes very peaty in character.

In general, the soil is easily cultivated, except when plowed too wet, when large clods are formed which are difficult to pulverize. The soil is very fertile and produces good crops, especially of corn. There are very few farms which contain much of this type, because of its limited and irregular distribution.

Sioux Sandy Loam.

This soil is a brown to black, coarse to medium sandy loam or heavy sandy loam. It varies in depth from 8 to 24 inches and contains much organic matter. The texture of the soil varies over the area from the true sandy loam types to loam soils and very sandy soils. The subsoil at greater or less depth is a waterworn gravel. On the average the gravelly content is very marked at a depth of about twe feet; in some places, however, much gravel is not found until five or six feet below the surface, and in other places much gravel is intermingled with the surface material. Considerable areas of pure gravel are known to be present, but in general the gravel is interbedded in a matrix of sandy loam, silty sand, or sand.

Owing to the topographic position of the soil, its open, porous texture, and the fact that it is underlain with sand and gravel, the natural drainage is good and often excessive. In dry seasons crops suffer from lack of moisture, and for this reason consideration should be given early maturing crops.

The sandy loam types occupy a large area along the western side of the county, next to the river flood plains. In the central part the sandy loam types give place to soils which are much more sandy and are classified as the Knox sand. Areas of the sandy loam occur also at other places over the county. The areas are known as the "Prairies" and the surface is in general level to slightly undulating. In the northwestern part of the county, and extending into Sullivan County, is a wide expansion of the area, known as the Shakes Prairie. The following paragraph will explain the name and its historical importance.

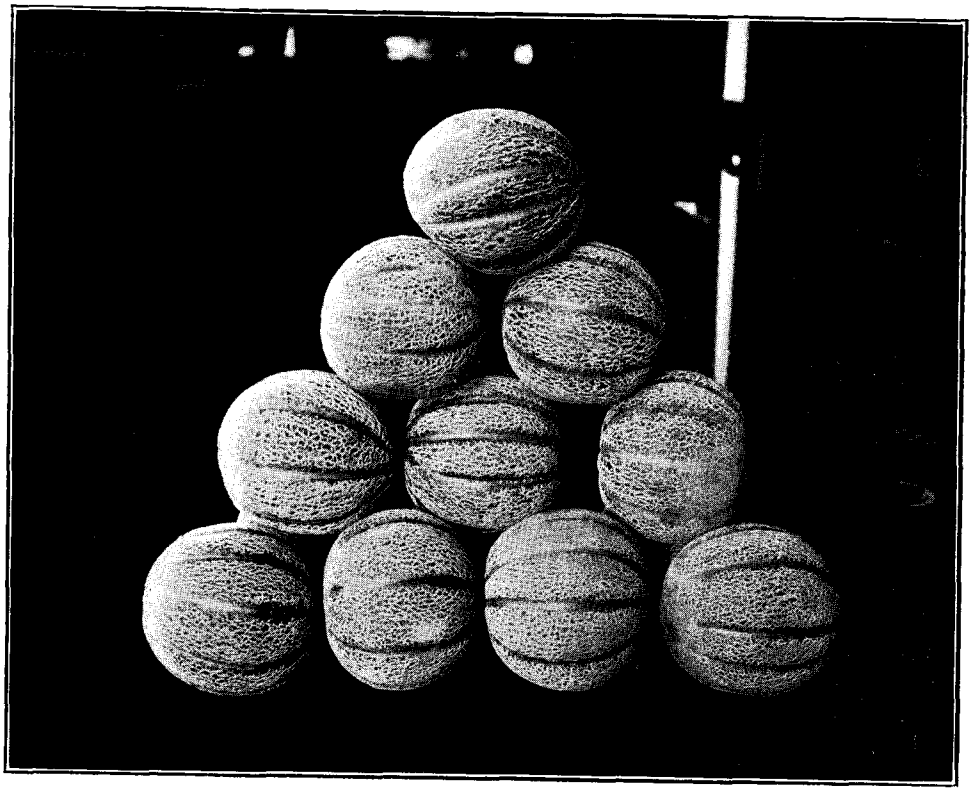
"Eight miles above Vincennes, we passed from the woodland flats into the south end of the prairie that extends up to Shaker-

town. * * * Shakertown, the residence of the Shakers, consists of eight or ten houses of hewn logs, situated on a ridge west of the bayou, eighteen miles above Vincennes. The site is moderately elevated. As we approached, the blackness of the soil and the luxuriance of vegetation was peculiarly attractive, but much water was standing on the low ground to the east, and a mill pond on Busseron Creek must suffuse the whole village with unwholesome exhalations. * * * Marriage is prohibited. From dancing, as an act of devotion, their name is derived. Like several other sects, they conform to great plainness in apparel, but their garb is peculiar. In language also they are very distinguishable. * * * In their dealings they are esteemed as very honest and exemplary. Until within a few months they entertained travelers without compensation; but the influx has become so great that they found it necessary to depart from their practice. * * * The estate of this place consists of about 1,300 acres. The mills which they have erected are a great accommodation to this part of the country, and to these they have added carding machines. * * * These people settled here before the late war (1812-1815); but after their estate was ravaged by the troop who went with Hopkins on his expedition, they sought refuge amongst their own sect in Ohio and Kentucky, and only returned last summer."*

The soil of the area owes its origin to stream action, being river terrace soil. The coarse material which forms the subsoil was deposited at times when the stream had sufficient velocity to transport coarse soil and gravel. Following the deposition of this coarse material, the finer and more loamy material was deposited as the velocity of the stream was diminished, thus forming a sandy loam. Where fine sand is abundant, the wind has aided in reworking the material and building up the mounds and small hills.

All the farm crops are grown. Corn is the chief crop, and the area is considered one of the big corn producing districts of the State. In 1910 the corn crop was very heavy; but in 1911 the crop was very slim. Because of the very dry growing season much of the corn did not ear at all, and some failed to even make a growth sufficient for fodder. Where excavations were made for examining the soil, the soil was entirely without moisture for 18 inches to more than two feet by the latter part of July. The season was exceptionally dry and the crop failure was the worst ever experienced. The average yield of corn is about 40 bushels; oats about

* "Travels through the Western County in 1816" by David Thomas, quoted from C. C. Oakey's "History Vigo County."



Ten Knox County Beauties. Photo—Purdue University.

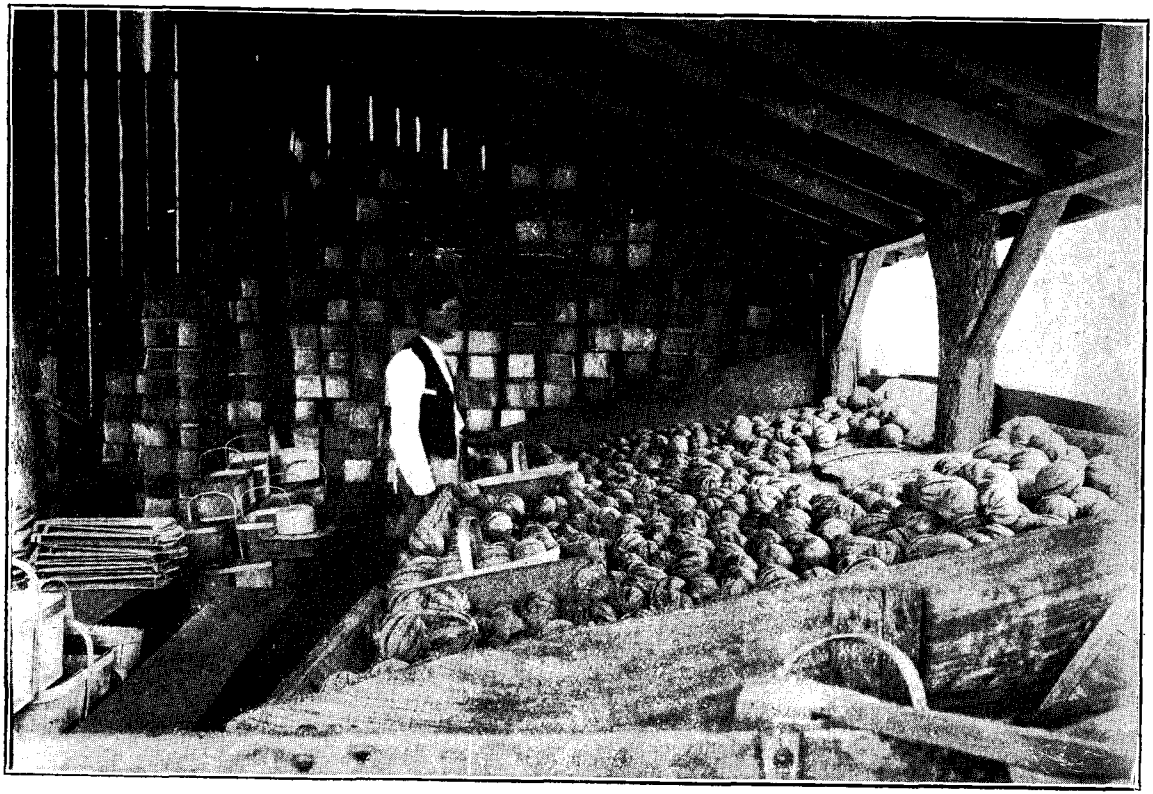
30 bushels, and wheat from 10 to 20 bushels. Clover grows well and a rather large acreage is usually grown.

The following table shows the results of mechanical analyses of the Sioux sandy loam:

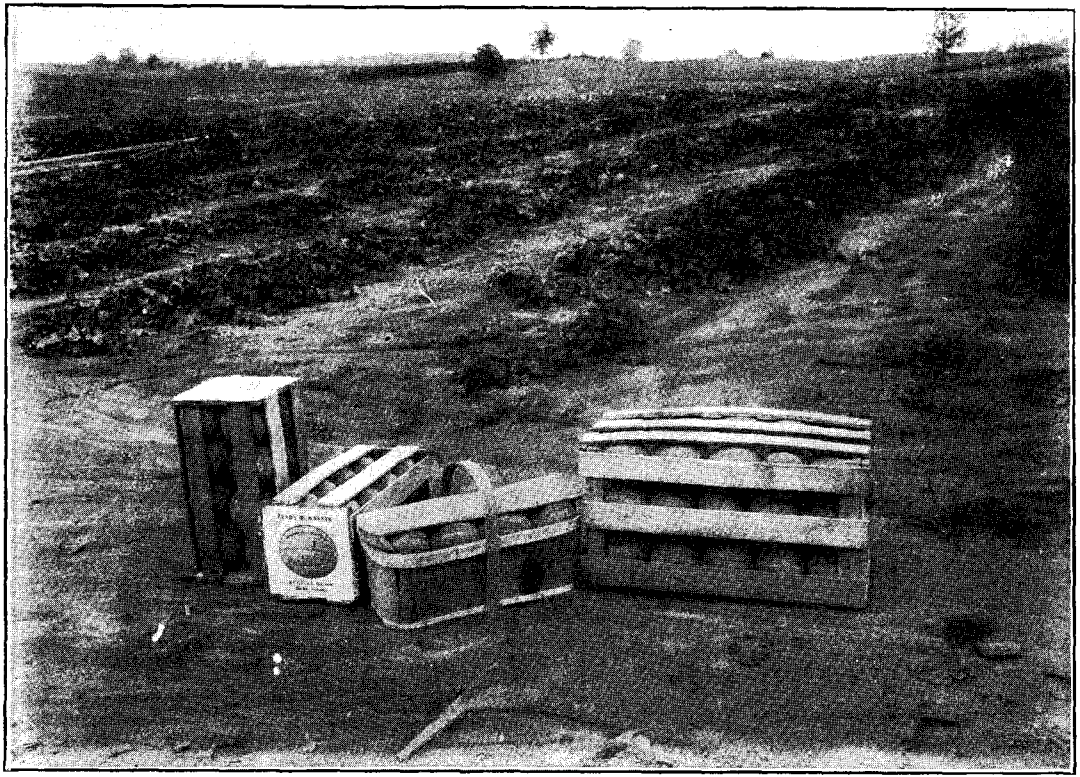
Location.	Description.	Gravel, Per Cent.	Coarse Sand, Per Cent.	Medium Sand, Per Cent.	Fine Sand, Per Cent.	Very Fine Sand, Per Cent.	Silt, Per Cent.	Clay, Per Cent.
3 miles west of Oaktown.	Surface 12 in.....	2.0	20.5	17.4	20.3	10.5	18.5	12—
3 miles west of Oaktown.	Subsoil 12 in.-24 in.	4.5	22.5	14.6	18.5	8.5	20.0	12
1½ miles west of Busseron.....	Surface 12 in.....	7.5	21.4	18.5	19.4	7.5	19.5	11.4
1½ miles west of Busseron.....	Subsoil 12 in.-24 in.	2.5	20.8	12.5	16.4	9.5	20.0	16 5

Knox Sand.

Extending west from Decker to within one and one-half miles of Iona lies the most productive sand hill area in Knox County. The material is from a medium to a coarse quartz sand. The coarse sand is in some places interbedded with fine or marly sand. The sand has in places a maximum thickness of about 100 feet. It is characterized by a typical dune topography, though somewhat subdued in outline because of the reworking and creep and other influences. This sand is of a dark, reddish-brown color, or light gray where it lies more level and has been leached. The subsoil is heavier than the surface and at a depth of from 12 to 14 inches, because somewhat sticky; at some places the subsoid at a depth of three feet or more is an orange colored sand mixed with enough clay to give it a plastic character. It is composed of pure wind-blown sand, lying in round top hills that raise successively throughout the whole extent of the area. To the northward the wave appearing hills become more rough and rugged, since they merge into the clay gradually, which is a firm loam. North, and bearing a little to the west, the sandhills extend into the district of Vincennes Commons and the Cathlinett surveys, but throughout this distance from Decker to Vincennes occasional clay hills and flats or bottom crop out among the sandy hills and give opportunity for the cultivation of grains, such as wheat, corn and oats. West of E. & T. H. Railroad to the Wabash River lies broad, extensive river bottom land of the Wabash and White River valleys. Upon the surface of the prairies and in the valley of the Deshee, a tributary of the Wabash, are a few hills of sand, similar in composition and appearance to those north and east of Decker, but they are



Crating and basketing for market. Knox County.



Musk Melon Field. Baskets and Crates. Knox County.

more scattering and cover a smaller area and indeed should not be counted as members of the Decker group.

The native forests of the hills are of small area and rather young, bearing fact of the youthfulness of the sand formations which were destructive to plant growth. Oak, white and black, sassafras, poplar, dogwood and maple make up the woodland. The largest forests do not grow far within the sandy soil region, but near the edge, where the sand and clay make a very valuable soil by being mixed together. Sassafras and sumac shrubs grow thick along many of the roadways and at the base of the hills.

The majority of the farms are small, containing 30 to 80 acres, still there a few landowners who have control of large tracts and also retain a deep personal interest in the cultivation of the soil. In the first case, the time of the owner is spent in the development of the crops alone and he neglects the improvement of buildings, fencing and of clearing away of the unnecessary shubbery from the division lines of farms and highways. The larger landowners have clean lands, well fenced, but within the whole area we do not find any modern home dwellings surrounded by landscape gardens, as we do elsewhere. The principal buildings are of rough lumber, are not often located near the home, but are scattered promiscuously over the hills and are used for the packing and preparing of products for the market. Those that have many acres live in the town and take little interest in making improvements.

Indian corn is usually grown on the clay outcrops among the sand dunes and it produces an average yield of 40 to 60 bushels per acre. Often it is tried upon the loose sandy hills, where the clay constituent is almost wholly absent, and under such conditions it is always cut short, since the sand has not the ability to retain sufficient moisture for the corn during the growing season. Wheat yields well, making from 18 to 30 bushels per acre, and is sown in the sandy soil as well as the clay.

Yet gradually these grains are giving place to the growing of the cantaloupe and watermelon. This reddish-gray sand extends to various depths, often reaching as much as 40 feet. The soil is loose and the roots of the melon vine find easy access to sufficient plant food so that they grow quickly and rankly. In the early spring extensive hot beds are used to germinate the seed to give them an advance growth before the warm summer season for transplanting opens. This brings the melons on the market nearly two or three weeks before they would be if the seed were planted di-

rectly in the field. The intensive farming of cantaloupes is practiced entirely in the vicinity of Decker, while farther away from the town the older method of field planting is still used. The annual return of the cantaloupe crops has been increasing steadily, and for the year 1911 the output was about 200 carloads. During the gathering and packing season, pickers come from the neighboring towns as well as from the homes of the territory, and are given $1 a day and board, or $1.50 and have the privilege of rooming and boarding at their own expense. Even then there is generally a great loss to the producers from the fact that many melons must be cast aside because they have become too ripe for marketing. The picking season of these melons seldom extends longer than four weeks and is generally several days less. The expense of marketing the cantaloupes is estimated after careful calculation at $120 per acre, but the owner in order to make his returns as large as possible has done away with commission men and ships direct to the eastern and northern markets, to the wholesale and retail dealers. In this way some have received a net gain of $1.25 on a basket during their early shipments. Later in the season the price drops to 35 and 40 cents. Those who practice the intensive farming are realizing a profit of $300 to $500 per acre.

The watermelon seeds are planted in the field and are not cultivated as carefully as the cantaloupes. Yet the return is profitable, ranging from $30 to $90 per acre. The long green melon sometimes known as the "Rattlesnake" melon is grown for early shipment, while the "Sweetheart" melon is grown for district marketing because of its firmness and large size. During dry seasons the crop is cut short and often averages as low as $50 per acre. In shipping the watermelon, the average prices received on the track was $130 per car, although they were retailed at the patch for 5, 10 and 15 cents per melon.

Because of the excellent flavor and quality of these crops, the formerly low rated sand loam is now held at the fabulous prices of $300 to $400 per acre, and the vicinity of Decker is ranked as one of the greatest melon tracts in the central West. More cantaloupes are produced in both Gibson and Jackson counties, but the acreage is more scattered and at no other place has the business reached the development and importance as in this locality. The principal variety grown is a strain of the Netted Gem and even rivals in quality and appearance the famous Rocky Ford.

Rattlesnake Melons. Note heavy, full foliage

SUMMARY.

Knox County is one of the best within the State, and ranks first in some of the crop productions. A very large percentage of the land is under cultivation and the improvements are from fair to good.

The uplands about Edwardsport have a higher percentage of clay than the typical silt loam. The principal timber growth is hickory, black and white oak, elm, sycamore, red maple, sassafras, white maple, Judas tree, ash and persimmon.

A large number of mules are raised in the northeastern part of the county, and throughout the area more mules than horses are used in the farm work.

A large acreage of little red clover is grown in the river bottoms in the northeast part of the county. Excellent stands are secured and heavy crops grown. Over much of the area the crop is cut for hay, and the second crop for seed.

Several plantings of catalpa and black locust of considerable size are put out. The trees are planted close and make a good growth. There are some small wooded tracts in the river bottoms. In general, the fields are cleared to the river banks and cultivated close. At Edwardsport there is a good line of cottonwood and black willow along the river.

Along White River the sand and gravel found in the bars is good and is being used for road material, building sand, etc.

The soils of the White River valley are very productive throughout and the farms are being kept up in good condition. The trumpet creeper and wild morning glory give much trouble in some fields. In the river bottom the tree growth is dogwood, redbud, willow, cottonwood, hackberry, elm, sugar, red and water maple, walnut, wild cherry, chinquapin and cow oak.

Much nursery stock is grown on the upland loess soils in the Knox silt loam east of Vincennes. The soil seems well adapted to the growing of all plants which the nurseries desire to grow.

In the upland area the wells are from 30 to 120 feet. The drilled wells average 60 to 75 feet. The dug wells do not exceed 55 feet. The water obtained is usually good.

In the area for several miles about Vincennes the farmers sell all straw to the paper mills. The farmers receive on the average only about one dollar per ton. The straw is of much more value to the farms for the amount of humus which it would add to the

soil. Before the paper mills were established, most of the straw was burned in the field.

A considerable number of hogs are fed through the western part of the county on the upland areas. Dairy herds of from 3 to 13 cows are numerous. Various breeds are used.

Widner and Busseron townships are the best tiled of any part of the county. Twelve carloads of tile have been put in the lowlands below Busseron along the railroad.

In places are found spots of gravel which are called "Lousy Ground," which seem to lack potash. The soil will produce a good heavy yield of straw but will not mature the grain. The burning of straw on the ground increases the yield. Some use an application of about 200 pounds per acre of a fertilizer known as the "Black Soil Special."

In the lowlands along the railroad at Busseron the soil is of a very mucky composition. In one case three crops of wheat were grown in succession; the first two yielded 31 bushels, and the last 24 bushels per acre. Corn yields from 50 to 90 bushels.

Cowpeas have been grown in the region about Busseron and Oaktown for about fifteen years. It has been shown that cowpeas planted about June 15th make much better growth than those planted earlier. If they are planted before the ground is thoroughly warmed they often become stunted and do not make a good growth at all.

Two examples were given of wheat planted in the fall of 1910 which did not come up until the following February, and made an average yield of 26 bushels.

In the black sandy soils are many glistening scales of mica which sparkle over the surface in the sunlight.

In the black soils to the southwest of Oaktown are some areas which are always loose and in which the plow will not scour. Corn does not mature, usually tassels out at height of two to four feet. In the black soil areas to the northeast of Oaktown is an area, near the place of Grizzle, which has a very bluish color. This soil was in tomatoes in 1911 and the growth was only fair, but no conclusion could be given as to an average growth because of the effect of dry weather.

There are some very large farms within the county, but the majority of the farms range from 40 to 120 acres. There is a large percentage of rented farms.

SULLIVAN COUNTY.

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

Sullivan County, organized in 1817, was named in honor of Daniel Sullivan, who was killed by the Indians on the road from Vincennes to Louisville while making a trip between the two places in Government service.

"It has been erroneously supposed and has been often repeated through mistake that the county of Sullivan upon its first creation extended northward to the lake of Michigan. As a matter of fact, its northern boundary was the Indian line separating Harrison Purchase of 1809 from the purchase of 1818, the line being established in 1809 at the time Harrison's purchase was made. This line extended from near Brownstown, through Gosport, to the boundary between Indiana and Illinois at a point about west of Hillsdale, in Vermillion County, and Sullivan County upon its creation comprised all the country southwest of the line (except a small portion attached to Orange County), and west to the west fork of White River and north of the present boundary of Knox County, or it comprised the greater portion of Owen and Clay, parts of Parke, Greene, Putnam, and Vermillion, and all of Vigo and the present Sullivan.

"The first county seat was Carlisle. It was stated that it was changed to Merom in 1819, but although the writer had access to all the State enactments prior to 1840, the law making the change of location could not be found, though every act was carefully scrutinized. At all events, by some means the county seat was changed to Merom, then probably the most important place in the county, not even excepting Carlisle, owing to the location of the town on the Wabash River and on an important and well traveled State road. Here it remained until 1830 (that date is correct) without serious molestation, though much dissatisfaction was expressed owing to the remoteness from the center of the county.

"The act which ordered the change of the county seat from Merom to the center of the county cannot be given. It was probably passed at the session of 1841-42 and in effect was similar in its provisions to the acts given above, approved January 29, 1830. Property owners of the town of Merom were given the right to exchange their lots with others similarly located in Sullivan, or they were paid the depreciation determined by a board of arbitrators. Considerable inconvenience, and in some cases injustice,

grew out of this novel mode of removal and adjustment, but time healed all wounds. Sullivan has since been the county seat.''*

The courthouse was erected at a cost of nearly $9,000, and was completed January 1, 1852. In 1872 it was remodeled and the wings were added to the end, leaving the building as at present, except the addition of a fire-bell in 1876. The structure as it is today has cost the county about $50,000. The first settlement in the county was made by the family of James Ledgewood, who located near the present site of Carlisle in 1803. The Ledgewood family were the first settlers north of Knox County and hold a prominent place in the history of Sullivan County. Other of the early settlers were Benjamin Price, Major Watson, Thomas Holden, Edward Parcell and Colonel Benefiel. Colonel Benefiel was a member of the first constitutional convention held in 1816. He represented Knox County, which at that time included Sullivan.

Sullivan, the county seat, with a population of 4,115, is located in the geographical center of the county on the I. C., the E. & T. H., and S. I. railroads, and the Terre Haute traction line. It has 11 mail routes, U. S. and American Express, Postal and Western Union Telegraph, Bell telephone, 1 mile of sewer, 3 bakeries, brick and tile mill, carriage and wagon factory, 3 flour and grist mills, planing mill, saw mill, woolen mill, bottling works, ice cream plant, 2 concrete block factories, 50 stores. The estimated number of employes in manufacturing plants is about 50, with an estimated weekly payroll of $500.

The town of Sullivan was founded as the result of the selecting of the place for the county seat. It was laid out in 1842. At the time of selection of the site the ground was little changed from the state of the virgin wilderness. It is said that the location was formerly wet and swampy, notwithstanding the slope to the creeks on either side. In 1843, water sometimes stood to the depth of two feet on the courthouse square. The coal mining industry has given employment to about 1,000 men, with an average weekly payroll of $1,500. Factories are needed here, and the people would gladly lend assistance by way of a free site and bonus to secure them. It is a good residence town, and good conditions are present to encourage the building of good substantial homes. The agricultural conditions of the surrounding country are good.

Carlisle has a population of 850. It is situated 10 miles south of Sullivan on the E. and T. H. Railroad. The town has industries producing metal kitchen cabinets, lumber, and medicines, also a

* Wolfe's History of Sullivan County.

creamery and two coal mines. There are about 20 stores, handling all kinds of merchandise. The town is situated in a rich and well improved agricultural region. It is chiefly dependent upon the growth and development of the country industries.

Carlisle, being the oldest town in the county, has several historical phases. It is one of the oldest American settlements in the State. The town was laid out in 1808 and a considerable settlement sprang up in that year. The early county courts were held here. The place of meeting often used was a large beech tree in the north part of the town. During the war of 1812 the town sent out several soldiers into the field. It was near this town that the "Dudley Mack" massacre took place during the war.

Hymera has 1,615 inhabitants and lies on the E. & T. H. and S. I. R. R., having four passenger trains daily. There are about 20 stores. It is a good trading center and is situated in the coal area, and mining is the only industry. About 500 men are employed in the industry and the weekly payroll is about $12,000. Factories to utilize the clay and shale of the mines would find a good location.

Merom has a population of about 520. The Union Christian College is located here, and it is this which keeps up the town. The bluffs along the Wabash are magnificent here and each summer a chautauqua is held here for ten days. It brings hundreds of people each summer to the town, and the boarding houses, restaurants and livery stables do a thriving business. Little is known about the early history of the town. It was the county seat for twenty-five years until 1842. It was then the most important town between Terre Haute and Vincennes. The situation on "The Bluffs" makes this an excellent location for campers, picnickers and public meetings. This should be well kept up along this line. A good roadway has recently been constructed from the top of the bluff to the river. A ferry crosses the river at this point. The railroad station is at Merom Station, two and a half miles to the south on the I. C. Railroad. Hack lines connect the two places. Merom Station is a good shipping point. During the melon season it is a very busy place. Much gravel has been shipped from this place. The gravel is very plentiful between the station and the lower river bottoms.

Shelburn has 2,065 inhabitants and is situated five miles north of Sullivan on the E. & T. H. and S. I. railroads, and the T. H., I. & E. traction line. There are three miles of crushed stone streets, five rural routes go out from the town. There are 25 stores of various kinds, two sawmills and lumber yards, and immediately

surrounding are extensive coal mines. The coal mining industry has always been the main source of support for the town. A few years ago it was thought that the coal deposits were about worked out and the town began to decline, but a lower and better vein of coal was discovered and since that time there has been a very good growth and development. Groups of houses have been built about the principal mines and make the settlement very town-like in appearance. Most of the mines are within a radius of three miles of the town. About 1,500 men are employed in the coal mines, receiving about $20,000 weekly. There are opportunities for further development in the natural resources. Much good farm land is found surrounding the town, but it has not been well improved. The surface has been neglected for the resources beneath the surface. Rapid development is now being made where the farmers own the land. Excellent offers are made to farmers of experience who wish to rent land either for grain rent or for partnership work.

Farmersburg had a population of about 1,115 in 1910. It is 12 miles north of Sullivan and is on the E. & T. H. Railroad and the Terre Haute traction line. The early town was known as Ascension, because of the founding of the Ascension Seminary there. The growth of the town was dependent upon this institution. At the present time the town is, as the name suggests, a trading point for the surrounding country. The town is far enough removed from other towns of size to insure good trade conditions, and the location would warrant the establishing of various enterprises, such as canning factories, creameries, etc. The water supply is good. Some good timber is still found in the vicinity.

Dugger, with a population of 1,226, is 10 miles east of Sullivan on the Vandalia and I. C. steam road. It has a flour and grist mill and a sawmill. There are several coal mines within a radius of three miles. The population has more than doubled during the past ten years, and the recent development of the coal and increasing transportation facilities are encouraging rapid progress. There are about 25 stores.

Paxton is situated between Carlisle and Sullivan and has a population of about 180. The town was platted in 1868, shortly after the building of the railroad, and was named in honor of an early merchant and physician of Carlisle. The surrounding farm land is very fertile and well improved.

Pleasantville is located in the southeastern part of the county. It is a mining town and trading center. The population is about 250.

The village of Cass is situated in the township of the same name, in the eastern part of the county. It has a population of less than 300. The postoffice has always been called Cass, but the town was formerly called Buell.

Fairbanks, in the northwestern part of the county, has a population of 110. It is situated on the old State road. This was one of the early towns which flourished in the days of the stage coach line from Vincennes to Terre Haute. There are no railroads and the town does not have prospects for much growth unless an interurban line should be built to connect with Terre Haute and Vincennes. An automobile hack line runs to Terre Haute. There is some good farm land surrounding, and some of the farms are being well improved.

Graysville is located on the old State road about four miles north of Merom. It was founded about 1850. The population is about 100.

New Lebanon is a little village located in the central part of the county, about six miles east of Merom. It has a population of about 125. The I. C. Railroad passes about a half mile north of the old town. A grain elevator has been built near the station.

Star City, Caledonia, Farnsworth, Superior and Wilfred are small villages and settlements which sprung up around various coal mines. Curryville is an old cross road settlement, just north of Shelburn. Scott is a site of a former postoffice in the north part of the county.

Land Grants, Donations and Surveys.

"The first settlements in Sullivan County were made on land that the French had obtained from the Indians during the French regime. These lands were in the vicinity of Vincennes and were later known as the Vincennes district. The treaty with the Indians for these lands was made in 1732, and the general description of the boundaries was 'lying between the point above, Pointe Coupee en haut, and the river Blanche below the village, with as much land on both sides of the Wabash as might be comprised within the said limits.' Pointe Coupee en haut was a mile or so above the mouth of the Busseron Creek in the southwest corner of what is now Gill Township. The village referred to in the treaty was of course Vincennes, and the river Blanche was White River. Thus the lands granted to the French by this treaty comprised practically all of Knox County, the southern part of Sullivan County, besides some lands on the west side of the Wabash.

"Some of this land was occupied by the residents of the county during the French and British control of the territory. After the American conquest and while Vincennes was commanded by the governors from Virginia, further dispositions of the lands were made under the authority of local officials. After the organization of the Northwest Territory in 1787, the disposal of the lands was regulated by Congress.

"In 1791 Congress passed a land law upon which were based subsequent titles to the lands of this district. This law provided--

"1st. That 400 acres of land should be given to the head of each family residing at Vincennes, or in Illinois country in the year 1783.

"2d. That a tract of land containing 5,400 acres near Vincennes which had been under fence and used as a pasture for thirty years, should be given to the inhabitants of Vincennes, to be used by them as a common until otherwise disposed of by law.

"3d. That the Governor of the territory be authorized to donate a tract of land of 100 acres to each man who first of August, 1790, was enrolled in the militia, had done militia duty and had not received a donation.

"4th. That the Governor upon application should confirm to heads of families the lands which they may have possessed and which may have been allotted to them according to the usages of the Government under which they respectively settled.

"5th. That where lands had been actually cultivated and improved, at Vincennes or Illinois country, under a supposed grant of the same, by any commandant or court claiming authority to make such grant the Governor might confirm such claim not exceeding 400 acres to each person.

"The bodies of land described in the first section have since been 'donations;' those in the third paragraph as 'militia donations;' and the last classes are generally known as 'surveys.'

"The status of the lands in the Vincennes district at about the time the first settlements were platted in Sullivan County is described in a letter from Gen. Harrison to James Madison in January, 1802. He said that the Governors' courts maintained at Vincennes under the authority of the Virginia commonwealth from 1799 on had assumed the right to grant lands to all applicants; that they did this for a time without opposition and concluded that as they were not interrupted they could continue as they pleased, that finally the whole country to which the Indian title was supposed to be extinguished was divided among the members

of the court and perhaps others, the lands thus disposed of extending along the Wabash River from LaPointe Coupee to the mouth of White River and forty leagues west and thirty east excluding only the lands surrounding Vincennes, which had been granted to old residents. The authors of this division had later perceived that their course was illegal and the scheme was abandoned but was revived a few years before 1802, and portions of the land purchased by speculators and sold fraudulently to eastern settlers. Harrison stated that upward of 500 persons had settled or would soon settle upon these lands in consequence of these frauds; that the owners pretended that the court had ample authority from Virginia to grant the land and that speculators had gone to Virginia, had secured a deed for a large tract, and had had it recorded and duly authenticated and had then made their fraudal transfers to the credulous.

"A large amount of litigation arose from this condition of land claims and it was several years before the claims were investigated and settled by the Government commissioner. A more complete account of the subject is now pertinent to the history of Sullivan County, but the fact that much of the land got into the hands of speculators and was offered for sale in Virginia to prospective home seekers no doubt explains the cause that attracted some of the first settlers to the region now included in Sullivan County.

"The lands about Vincennes were, as already stated, ceded by the Indians to the French in 1742, but on June 7, 1803, General Harrison concluded a treaty with the Delawares, Shawnees, Pottawatomies, Miamis, Eel River Weeas, Kickapoos, Piankeshaws, and Kaskaskias which confirmed this cession. The northern boundary of the cession as described in the treaty is a matter of history in Sullivan County. Pointe Coupee on the Wabash just above the mouth of the Busseron was the principal point on this boundary. The line did not run due east and west through this point, but at an angle of 12 degrees from this direction, its general course being from northwest to southeast. The treaty also provided that in case some of the settlements on locations of lands made by the citizen of the United States should fall in the Indian country, the boundary might be altered to include these settlements.

"This is the origin of the 'old Indian boundary' in Sullivan County, the line that so often figures in the land descriptions of the southern part of the county. A small portion of the southwest corners of Gill and Jefferson townships is south of this line,

and the greater part of Haddon Township is by this line shown to be the cession which was confirmed by the treaty of 1803. In Haddon Township, the boundary leaves the straight course at right angles, so as to include within the ceded area a rectangular body of land lying about three miles northeast of the general direction of the boundary. In this rectangle is the town of Carlisle. It is probable then when the survey was made this deviation from the regular course was made in accordance with the clause of the above treaty in order to include some settlements that otherwise would have been left in the unceded Indian country.

"To satisfy the claims of the old French settlers, the United States directed to be set apart all the lands bounded on the west by the Wabash River, on the south by White River, on the east by the West Branch, on the north by the north bounds of the old purchase.

"Four hundred acres was assigned to each person entitled to a donation. The land has never been surveyed by the order of the Government, consequently it has never been regularly performed, and the maps of this territory within these boundaries are generally blank. All lands held in this quarter are therefore under French grants, except some militia claims. In locating it was necessary to begin at the general boundary or at some corner of lands, lines of which would lead thither, but no course was given, and the claimant settled the point with the surveyor as he deemed most to his interest."*

Transportation Facilities.—The transportation facilities of the county have passed through the entire line of the evolution by means of travel. The following account from Wolfe's History of the county, page 139 to 147, gives a good account of the early condition:

"Hundreds of flatboats annually descended the Wabash and White River. The trade of the Wabash River is becoming immense. In 1831, during the period between March 5th and April 16th, 54 steamboats arrived and departed from Vincennes. It is also estimated that at least one thousand flatboats entered the Ohio from the Wabash at the same time. In February, March and April of the same year were 60 arrivals of steamboats at Lafayette."

The writer tells us that one-tenth of the flatboats according to the estimate were "loaded with pork at the rate of 300 barrels to the boat;" another tenth said to be loaded with lard, cattle, horses,

* Wolfe's History of Sullivan County.

oats, corn meal, etc., and the remainder with corn on the ear. The value of produce and stock sent annually to market from the valley of the Wabash was estimated by one authority at nearly one million dollars.

"Corn is shipped on the ear. The southern planters preferred is so to being shelled and sacked since it was less liable to spoil. Among the staples brought back from the south was New Orleans sugar. Of course sugar was a luxury and until the steamboat era reduced the cost of transportation the pioneers generally depended on maple sugar, and other home-made substitutes. Even after steamboat traffic became general a large proportion of the imported merchandise used in Sullivan County was brought in overland from Louisville and Evansville. For a number of years a man named Webb of Merom carried on an extensive business of hauling goods overland. He had several good teams in which he took much pride.

"Busseron Creek was also considered a navigable stream during the flatboat era. Owing to the presence of forest growth and lack of drainage, the waters of this and similar tributaries were greater in volume and less fluctuating than in later years and during the spring freshets it was possible to float boats loaded with produce down the current of Busseron. Caledonia was once a center for the flatboat traffic. The boats were also loaded at Carlisle and other points.

"For the transportation of mails and passengers, the pioneer epoch had few regular facilities. Mails were carried overland from Vincennes to Merom and Terre Haute, usually on horseback. Travel was usually by the same means and the individual traveler depended on his own horse and followed such roads as he found through the wilderness. When steamboats began running up and down the river, mail and passengers were conveyed on the boats and about the same time the State Road was constructed from Vincennes north through Merom to Terre Haute. For many years this road was the principal thoroughfare for all kinds of traffic up and down the Wabash valley. The river was not navigable at all times of the year and consequently the stage road was more to be depended upon for transportation the year around. A line of stage coaches ran over this route even for a year or more after the building of the railroad north and south. Merom was a regular station on this line which passed through Graysville and Fairbanks into Vigo County.

"Following the era of river, canal and stage transportation came the railroad. During the stirring epoch of internal improvement of the early thirties railroads and canals were planned to supplement each other. Eight railroads were chartered in Indiana Legislature in 1882 and during the next five years twenty-eight charters in all were granted for the proposed lines, but for the time the canals were pushed with greater energy and the era of railroads in Indiana begins with the middle of the century."

At the present time, the county has fairly good transportation facilities. The E. & T. H. runs north and south through the county, the Indianapolis–Effingham division of the Illinois Central crosses the county from east to west near the center. Branch lines and spurs from the Southern Indiana, the Monon, the I. & V. and the E. & T. H. permeate all parts of the coal bearing area in the eastern and northern parts. The northwestern third of the county is without railway facilities. An interurban line runs from Terre Haute to Sullivan. More interurban lines are needed in the county, a line running from Terre Haute through Fairbanks, Graysville, Merom to Vincennes, would open up great development within the western part of the county.

The Wabash River may be made navigable and will no doubt be so used in a few years.

The county has about 1,000 miles of public road with about 350 miles improved. By far the greater percentage of the roads are improved with gravel, about 100 miles being improved with crushed stone. The stone comes from Thornton, near Chicago, some from Spencer, some from Bedford, and some from local quarries. The stone from Thonton is secured at a very reasonable rate as in that manner the railroad can have loaded cars in both directions, loaded with coal for Chicago and on the return hauling crushed stone. The gravel is derived from deposits along the flood plains and terraces. The principal areas are west of Fairbanks and in the vicinity of Merom Station. The Merom Gravel Company has furnished large quantities for local use and also shipped a great deal. The pits have from 20 to 30 feet of gravel down to water, with very little soil and clay. The deposits extend to the river and the gravel company is pumping gravel from the bed of the river. The eastern townships of the county have no gravel deposits and the native rock is not of very good quality. The first improved roads were built in 1895 and the work has made a very marked progress.

The Sullivan County Agricultural Society was organized at Carlisle in 1852 and the first fair held that fall. In a few years, Merom and Sullivan became rival claimants against Carlisle for the fair, but when the directors decided to let the fair be held at the place which contributed the most money, Carlisle retained the title and thus secured the fair meetings for the following five years. The fairs were held at Carlisle for twelve consecutive years but the attractions were meager and popular interest almost compltely failed during the years of the war. In 1865 it was decided to have all succeeding fairs at Sullivan and the first fair was held at the county seat in 1866. For a few years the fairs were moderately successful, but the one of 1878 was so complete a failure that no more was heard of the association until 1885. In 1886 a very successful fair was held. In 1888 the grounds were improved by a new track and deep wells being sunk on the grounds and a new amphitheater and floral hall. Since 1896 there have been no county fairs.

In 1908 a series of "peoples' Saturday fairs" was inaugurated. These comprised various attractions and events and drew large numbers of people into Sullivan and created great interest. These were held each Saturday from August 15th to October 31st. In 1874-76, the Grange was an important organization among farmers and tradesmen in this county. On July 24, 1899, the Farmers' Mutual Benefit Association was organized at Pleasantville. "The objects of this organization were to unite farmers in all matters pertaining to the interests of their calling, to improve the method of agriculture, horticulture and stock raising, to devise and encourage such systems of concentration and co-operation as will diminish the cost of products."

It attempted to maintain a farmers' store; it also sought to secure a legislation in behalf of the farmers; it also tried to operate a milling plant and a grain and wool warehouse in the interests of its members. It was a part of the great national movement and died out with the passing of the crisis of the movement in the United States. The first farmers' institute was held in 1899 and an organization formed which still holds its meetings at different parts of the county and the attendance and interest is usually good at these meetings. The farmers and wives engage in practical discussions and experts are also invited to the meetings to instruct its members.

General.

Sullivan County has developed rapidly during recent years, due to the extensive mining interests in the county. The population in 1830 was only 4,696; in 1850 it had reached 10,500; in 1910, to 32,439—an increase of 6,434 during the previous ten years. "The Indiana Gazetter," published in 1850, has this to say of the industries in Sullivan County at that time: "There are in the county 11 grist mills, 9 sawmills, 4 carding machines, 4 lawyers, 16 stores, 17 physicians, 20 preachers, 20 blacksmiths, 30 carpenters, 10 coopers, 5 saddlers, 17 shoemakers. The taxable land amounts to 168,129 acres and about 70,000 acres still belong to the United States, of which at least half is of a very poor quality. Coal is found in abundance and Sullivan ought to be among the richest counties in the State."

The total farm area is 272,012 acres of which 227,784 are improved. The average selling price is $50 to $110 per acre unless underlaid with coal, when it is valued much more highly. Some small areas can be bought for $20 to $30. Sullivan County ranks fifth in the State in the production of alfalfa; third in acreage of peas; fourth in acreage of watermelons and cantaloupes. It stands fourth in the sale of sheep.

The county produces annually about 2,085,000 bushels of corn, or an average of about 35 bushels per acre; wheat, 427,465 bushels, averaging about 21 bushels per acre; oats yield about 210,500 bushels, or an average of about 25 bushels per acre; about 7,000 bushels of rye with an average per acre of about 15 bushels; a very small acreage of buckwheat is grown, principally for bees; from 28,500 to 32,700 tons of timothy hay are grown annually, averaging about 1½ tons per acre; alfalfa is grown on about 100 acres each year, yielding from 1½ to 4 tons per acre; a few acres of prairie hay is grown, yielding from 1 to 2 tons per acre; clover has an acreage of over 3,000 acres yielding more than a ton per acre. Potatoes yield over 9,000 bushels or from 30 to 35 bushels per acre. Some onions are grown for the market; they make from 50 to 350 bushels per acre. Berries have a small acreage, but yield from 36 to 75 bushels per acre. Tomatoes are raised on about 50 acres, yielding from 40 to 100 bushels per acre. About 200 acres of cantaloupes and 900 acres of watermelon are grown.

Some horses, mules, and cattle are raised for the market each year, hogs number about 17,000 head per year; sheep average

about 17,500 per year, being the fourth county for rank in sheep raising. Poultry raising receives considerable attention in this county.

Physiography and Geology.

The surface of the county is principally level. Some broken country lies in the northeastern part and along the eastern side, but the rougher areas are along the streams; the sand hill regions present an undulating surface. The stream valleys are wide, and about one-fifth of the country is occupied by the flood plains and terraces. At Merom the river bluff has a height of about 170 feet. Here and at the narrows in Section 25 (9 N., 11 W.) the river flows directly along the bluff. Below Merom the Wabash valley is from two to four miles wide, the terrace is made up largely of gravel; above Merom the valley is from one and a half to three miles wide and the terrace is quite sandy.

The coal measures are the only geological formations represented in the surface rocks of the county. The rocks are everywhere, except along the stream, covered with drift or loess to a depth of 10 to 50 feet or more. The eastern part of the county is more broken than the central or western and the soils are thin and poor.

Three coal veins of workable thickness are mined at many places in the eastern half of the county. The main line of the E. & T. H. marks approximately the western limit of present mining operations. To the west of this line the coal veins are so far below the surface that they cannot now be profitably worked under present mining conditions. In future years these deeper parts will be worked, as will also the thinner veins. Good beds of shale and underclays are found in the eastern part of the county. These deposits should be utilized for the making of such wares as conduits, sewer tile and other vitrified wares. The only use now is for ordinary brick and drain tile.

The following description by David Thomas in his "Travels in the West" is here quoted from Wolfe's History of Sullivan County and gives a good description of the surrounding country as viewed from Merom bluffs.

"From the most elevated point of the bluff the eye can be gratified with a charming view of LaMotte Prairie immediately below in front; and with Ellison's and Union prairies on the right and left. The whole stretching along the river a distance of not

less than 30 miles, are all now rapidly settling. In the rear of this beautiful sight is a flourishing settlement of 20 or 30 farms, three miles east of town.

"Gill's prairie, south three miles, has at present a handsome population of industrious farmers."

Section at Merom Bluff.

	Feet.	Inches.
Loess and drift	30	0
Soft sandstone, upper beds disintegrating	20 to 25	0
Massive sandstone, Anvil Rock with ferruginous seams and veins	10 to 25	0
Conglomerated pieces of shale, coal, pebbles and sandstone, bedded in calcareous material	2 to 8	0
Fossiliferous limestone	2 to 4	0
Dark clay shale	2	0
Rash coal	2	0
Black slate	1	2
Fire clay with pyritized pebbles	4	6
Light drab clay shale	5	0
Bituminous shale, small iron ore nodules	6	7
Fossiliferous limestone	2	0
Marl clay	1	6
Drab clay marl	1	2
Dark bituminous and calcareous shale	6	2
Black sheety shale	1	6
Coal	1	6
Fire clay	2	8
Fire clay, pyritous	1	6
Dark soapstone, iron stone pebbles	3	0
Silicious flagstones	2	0
Light blue argillaceous flagstones	2	0
Fossils	5	0

Section of Mine Shaft at Star City.

	Feet.	Inches.
Surface and drift	15	0
Shaly sandstone or shale overlying sandstone	45	0
Blue clayey shale	20	0
Coal	4	6
Underclay	6	0
Limestone	3	0
Gray to blue shale	20	0
Coal	5	0
Shale	10	0
Total	128	6

Section at Mine Shaft at Farnsworth.

	Feet.	Inches.
Soil and drift clay	12	0
Gray sandy shale	17	0
Blue clayey shale	8	0
Coal	3	4
Underclay	8	0
Grayish limestone	2	8
Blue clayey shale, with occasional nodules of iron carbonate	18	0
Dark bituminous shale, fissile	3	0
Coal	5	6
Total	76	8
Under clay merging into gray sandy shale	?	?

Section of Mine Shaft at Hymera, S. W. of N. E., Section 23.

		Feet.	Inches.
Soil and drift		27	0
Coal (outcropping)			6
Sandstone	3 to	5	0
Clay shale		12	0
Coal	5 to	8	0
Fire clay	2 to	3	0
"Hard rock"			..

Section from Oil Well at Sullivan. The Total Depth of Well Is 549 Feet. Depth Here Given Is 111 Feet.

	Feet.	Inches.
Soil	5	0
Gray clay with thin partings of white sand and pebbles	8	0
Glacial hardpan or bowlder clay	2	10
Limestone	0	3
Black shale	0	8
Coal	0	2
Gray, silicious fireclay	8	0
Clay shale, iron nodules	7	0
Brown sand rock	20	0
Gray sand rock sharp	10	0
Clay shale	30	0
Coal and shale	0	9
Clay	5	0
Sand rock	15	0
Total	111	10

Section of Mine Shaft at Dugger.

	Feet.	Inches.
Earth	10	6
Sandstone	19	6
Shale	5	0
Blue shale	10	0
Coal	4	0
Clay shale	7	0
Sandstone	12	0
Limestone	10	0
Hard sandstone	25	0
Shale	3	0
Coal	8	0
Black shale	2	6
Sulphur	1	0
Very light clay shale, very soft	7	0
Black shale, very soft	10	0
Black shale, very soft, occasionally "hard head"	8	0
Sandstone, very hard	2	6
Dark blue clay	4	0
Grey shale	8	6
Very hard limestone	2	0
Black shale	6	0
Coal	6	0
Black shale	2	0
Total	174	0

Drainage.—The drainage of the county is chiefly into the Wabash through Thurman's, Turtle and Busseron Creeks. The southeastern part drains into White River with the exception of a small area which drains into the Wabash by the Marie Canal. The Wabash flows a distance of 40 miles. The low water level at Merom is about 420 feet above sea level. The river is fully described under Vigo County.

Busseron Creek rises on the clay plains at the borders of Clay and Vigo counties near the level of Eel River. It flows diagonally across Sullivan County into the Wabash. For some distance near the mouth, the stream seems to occupy a preglacial line of drainage but the upper portion is apparently independent of preglacial drainage.

Knox Sand.

Since the cowpea is grown so extensively on this type of soil and because there are other extensive areas where the crop should be grown, it will be well to give here some description of the cowpea and information as to its culture.

The assertion that "what red clover is to the North and alfalfa to the West, the cowpea is to the South" was some fifteen years ago strictly true, but today it is not the whole truth for the cowpea has advanced into the regions of red clover and alfalfa. A few years ago the cowpea was scarcely known north of the Ohio River, but during the past few years it has extended to the north limit of successful cultivation of dent corn.

The cowpeas, beans, clovers, alfalfa and vetches are known as leguminous plants. In the variety of its size, habits, production and uses, as well as the soils and localities to which it is well adapted, the cowpea rivals and even surpasses corn. Some sorts mature seeds within sixty days from planting, other maintain vigorous growth for six months or longer, even putting forth flowers until the vines are killed by frost; some are short, stocky and erect in growth; others rapid climbers while others travel along on the ground and produce great masses of vines. The seeds vary in color, size and shape, flat round, oblong, kidney; black, white, red, purple, yellow, striped, mottled; small, medium, large. The cowpea will grow on any soil not too wet and in most climates free from frost during the summer months. The stalks and leaves make fine hay, the best of temporary pastures and most excellent green manure; its seeds, green or ripe, are as nutritious as beans and are as much relished for use as human food, or as ripe grain, afford the richest kind of feed for all farm animals. The selection of a variety will naturally depend upon what is wanted in the crop, for the same reasons which leads many farmers to plant a dent variety of corn for grain and a flint for silage or fodder because the flint may give a larger appropriate stalk and a greater proportion of leaf. If hay is required, the variety should be a vigorous growing, late maturing and erect growth to make harvesting more easy. If pasture or green manure is wished, the pea should be planted early in the spring and be a vigorous growing variety. For seed production, special varieties are selected. For table use, others which are tender and of good flavor. The cowpea readily adapts itself to local conditions and some selected strains of these varieties will doubtless prove most useful to northern growers. By picking the first ripened pods for several seasons in succession and saving the early seed for planting, a very valuable local strain may be developed. This method of selection may be followed to obtain a large or long vine or any size or shape to suit north or south, upland or lowland.

Although the cowpea will, as a rule, make better growth than

any other plant under unfavorable soil conditions and even where other crops have failed, no crop thrives better on rich ground or more amply repays liberal feeding and intelligent treatment, than the cowpea. It must be remembered, however, that one of the main gains for which cowpeas are grown is the absorption of nitrogen from the atmosphere, and this cannot take place fully under unfavorable soil conditions. The soil should be mellow, well drained and deep. It should have plenty of air and should not be acid. Acid lands are but little benefited by cowpeas. The soil should be well prepared, deep plowing and working down to smooth fine curface essential. The seed may be sown broadcast or drilled. On most soils, the crop will be benefited by the addition of some fertilizer. If potash or phosphoric acid are deficient, the amount of nitrogen which the plant lives on will also be limited.

Cowpeas make a good cover crop for orchards. Cowpea hay is best if cut and properly cured when the early pods begin to ripen. The hay cures slowly and is subject to heating like red clover and must for that reason be thoroughly dry before storing away. This crop is one of the best for grazing and soiling, as it gives more and better feed in the season with less expense than any other crop.

The cowpea always leaves the soil in a better condition than before the crop was grown. It helps the physical character of the soil by sending the long tap roots down into the subsoil and loosening and making more porous; and it helps the soil chemically by the storage of nitrogen in an available form for other plants.

The examination of the roots of a healthy cowpea or other legume shows many little bunches, nodules or tubercles, varying in size from that of a pinhead to that of a pea. They have about the same consistency and much the appearance of very small potatoes, but a microscopical examination shows them to contain myriads of living organisms or bacteria. These bacteria draw a small part of the mineral part of their nourishment from the roots on which they grow, but the greater nitrogen supply essential to their life is gathered from the air, which circulates through the soil. Each of these low forms of life exists but a few hours and goes through a process of decomposition similar to that which takes place in other organic matter. The only difference is that when vegetable matter decays it leaves the soil only what it has taken from it, but these bacteria add the nitrogen which has been absorbed from the air and changed into an available form for other plants. When plants other than legumes, such as rye, oats, etc., are used for

green manuring they really add nothing to the soil except what they absorbed from the same during their growth. They, however, change some of the mineral constituetns of the soil into a more available form.

Nitrogen is the most expensive element of fertility and if this can be supplied through the growing plant it is a great saving in the supplying of one of the essential foods. The value of any material as a soil renovator depends largely on the nitrogen, potash and phosphoric acid it contains. The following table from the year book (1895) of the U. S. Department of Agriculture, gives the percentages of these elements in common hay and fodder crops. As these percentages are largely influenced by the water content of the material, the table also shows the percentage of moisture:

Hay or Forage.	Water, Per Cent.	Nitrogen, Per Cent.	Potash, Per Cent.	Phosphoric Acid. Per Cent.
Cow peas	10.99	1.95	1.47	.52
Red clover	11.33	2.07	2.20	.38
Alfalfa	6.55	2.19	1.68	.51
Timothy	7.52	1.26	.90	.53
Wheat straw	12.56	.59	.51	.12

Any crop cut from the field takes away a certain amount of mineral substance which is lost to the soil. To derive the full value from any plant it is necessary that the whole plant be turned under as green manure. The renovation of the soil by the cowpea depends, then, largely upon the use which is made of the crop. In addition to the taking of nitrogen from the air, the cowpea has the wonderful ability to use the potash and phosphoric acid when these materials are liberally used on cowpeas. The soil gains far more than the cost of the fertilizer. The cowpea stands first among the legumes as a producer of nitrogen fertilizer. The crop may be grown between crops of wheat and thus furnish nitrogen for many succesive crops.

SUMMARY.

There are a number of good silos in the county. On the stock farm of William H. Jones, two miles southeast of Merom Station, near the center of Section 33 is a cement silo 56 feet in height and 36 feet in diameter. This silo at the time of its construction a few years ago was the largest in the United States, and at the present time it is said to be the second largest.

Purdue University Bulletin No. 91 is an excellent treatise on construction, materials and capacity of round silos that may be had for the asking.

VIGO COUNTY.

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

Vigo County was organized in 1818 and has an area of 402 square miles. It was named in honor of Col. Francis Vigo, originally a Sardinian, a true friend of General Clark in the capture of Vincennes, and afterwards a most worthy citizen of the county. The first settlement made in the county was around Fort Harrison. The march of Harrison's army to the upper Wabash, the battle of Tippecanoe and the establishment of the fort seemed to impress the people with the importance of the region, and soon after the war of 1812, public attention was turned to it. In the survey of the land hostile Indians opposed the work. A company of settlers on Busseron Creek were defeated in 1815 and a number of children taken prisoners, who were never recovered.

At the close of the war in 1816, an act was passed by Congress granting lands to certain Canadian volunteers, who had been citizens of the United States, and during the war joined the United States force, and as a consequence their property in Canada was confiscated. The act permitted the land grants to be located, before the public sale in the land district, which included Vigo County. The sale took place in June, 1816, and many settlers had selected choice places and founded their homes with the intention of buying the tracts at the sale; but it proved that much of the land had been located by the grant refund and many of the settlers left for the prairies of Illinois. The unfriendliness between the Canadian settlers and others greatly retarded the settlement of the county.

The county is divided into eleven townships: Harrison, Sugar Creek, Prairie Creek, Otter Creek, Linton, Nevin, Pierson, Fayette, Honey Creek, Lost Creek and Riley.

Terre Haute, the county seat, and the fourth city in size in the State, was laid out in 1816, and the first sale of lots took place in the spring of 1818. In 1820, the river became very low, the wells were dry and there was much sickness and death. This was a blow which required several years to overcome. The city was laid out by a company called the Terre Haute Company. The original site selected for the town was about three miles below the present location, but it was soon abandoned for the more suitable situation. One of the principal reasons for moving was that the National Road crossed the Wabash at the latter place. In 1817, there

were but a few log cabins of the rudest style situated along the river. But when the town was made the county seat in 1818 a very substantial growth began. The first court house was erected in 1821-22.

The word Terre Haute is from the French and means high land. The city is favorable situated on the high bank of the Wabash several feet above the ordinary water level. The population in 1830 was 600; in 1834, 900; in 1850, about 3,500; and in 1910, 58,157, an increase of 21,484 over 1900.

Six main lines of railroads pass through the city, the Vandalia, C., C., C. & St. L., E. & T. H., C. & E. I., Southern Indiana and the Terre Haute and Eastern Traction Company. Some of these roads have more than one line and there are branch lines of other roads into the city. Several rural routes go out to various parts of the surrounding country. According to the Department of Statistics for 1910, there are four daily and six weekly newspapers, 30 miles of sewer, 25 miles of brick and asphalt streets, 25 public schools employing 253 teachers, 4 parochial schools, 4 colleges and 54 churches, 9 banks and 21 building and loan associations, 2 automobile factories, boot and shoe factory, 26 bakeries, 2 breweris, 10 brick and tile mills, 2 carriage and wagon factories, canning factories, 20 cigar factories, 7 garment factories, 4 distilleries, 2 sawmills, 2 architectural iron works, 2 artificial stone works, railway shops, coal mining machinery works, fence factories, and other small factories of all classes. There are many good stores and business houses, the number is about 2,000 of all kinds. The estimated number of employes in the manufacturing plants is 12,000; the estimated weekly payroll $140,000.

The Commercial Club in the past three years has spent $300,000 locating factories. It is always willing to give worthy industries sites for building, in addition to which it is willing to pay a fair cash bonus if the number of people employed will justify it. The industries most suitable to local conditions are those which desire a central location, cheap fuel, an inexhaustible supply of good water, and good railroad facilities. Steam coal is available at 85 cents per ton.

The raw material available in the vicinity of Terre Haute for manufacturing purposes are shale, clay, stone, sand for building purposes, glass sand, gravel and coal, the output of the latter being controlled by more than 20 corporations.

Terre Haute is the only city and West Terre Haute the only incorporated town in the county.

West Terre Haute is on the west side of the Wabash River, one mile from Terre Haute. It is on the Vandalia Railroad and the Terre Haute, Indianapolis and Eastern electric line. Two rural routes go out from the town. There are two public schools employing 16 teachers, 16 churches, 2 banks, 2 building and loan associations, a business men's association and a commercial club, a canning factory, 4 brick and tile mills, about 30 stores. The estimated number of employes in the manufacturing plants is 500, with a weekly payroll of $6,000. The population is 4,000.

Seeleyville is located on the Vandalia Railroad and T. H., I. & E. interurban line, eight miles east of Terre Haute, not far from the Clay County line. The town owes its origin to the mining industry, and is almost entirely dependent upon that work. There is one public school with 6 teachers, 2 churches, 9 general stores and a drug store, and a building material yard. The population is 1,200.

Pimento, which was formerly called Hartford, was laid out in 1852, while the Evansville and Terre Haute railroad was being constructed, and has depended almost entirely for its prosperity on its importance as a shipping point. About 1877, a flouring mill was erected, and this with one or two stores of former years and with occasional additions to business activity has made it a quiet little market for the surrounding country. The interurban line now passes through the town. The population is about 175.

Lockport, or Riley, was one of the early towns which flourished in canal days. It was platted in 1836. The E. & I. Railroad passes through the village. Until a few years ago this was the largest village in the county. The population is about 400.

Lewis is a little village in the southeast corner of the county. It is on the Southern Indiana Railroad. It has a grain elevator and is a good trading center for the surrounding country. Population, 200.

Prairie Creek, or Middleton, is near the south side of the county, in the western part. It was platted in 1831, in the days of stage coach traffic between Vincennes and Terre Haute. A tavern was one of the principal features of the town. A steam mill was built in 1847. The nearest railroad is six miles away and for that reason the town has not made much growth. Good roads lead through the town, both north and south and east and west. The population is 160.

Prairietown is a small village which owes its origin to the stage coach days. It was known as "Hoggart's." It was the cen-

ter of a Quaker settlement. A few small stores are the only industries. There is a fair school building situated in a pretty grove of oak trees. It is surrounded by a rich agricultural region. The population is about 250.

Youngstown is a little residence village on the interurban line southeast of Terre Haute. It is a good location for persons who wish residences in rural villages and have their business interests in Terre Haute.

Sanford is on the Big Four Railroad on the western side of the county to the northwest of Terre Haute. The interurban line also passes through the village. There are no industries. The population is about 200.

New Goshen is a village of 200 in the central northwestern part of the county, and to the east of Sanford.

Libertyville is an old village in the northwestern corner of the county on the county line.

Tecumseh, or Durkees Ferry, is on the west bank of the Wabash River, about seven miles north of Terre Haute. This point was once one of the main crossing points on the river. It is a German settlement. A few small stores and a postoffice are located here. The view of the river valley from the hills at the back of the town is one of the best in the county.

St. Marys is a little town to the northwest of Terre Haute. The population is about 175.

Coal Bluff (500) and Fontanet, which formely had a population of 500 but now much less, owe their origin to the Coal Bluff Mining Company, which operates several mines in the northeastern part of the county. The towns are on the Big Four Railroad. Fontanet was the site of the Indiana Powder Mills, which were destroyed in 1906 by an explosion which practically destroyed the town and killed several persons. The mill will never be rebuilt. The land, property and houses have been offered for sale.

Atherton is a mining village on the northern edge of the county. Burnett, Heckland, Edwards, Ehrmandale, and Hutton are place names, such as former postoffices and mining settlements. Blackhawk is a station in the southeastern corner of the county.

Transportation Facilities.—The transportation facilities of the county are good. There are ten or twelve railways within the county. These are the St. Louis Division of the Big Four and the main division of the Vandalia, both of which pass east and west through the county; the Peoria division of the Vandalia, running northeast to Peoria, Ill.; the T. H. & L. division of the Vandalia,

northeast to Logansport and South Bend; two of the main divisions of the C. & E. I., running northwest and northeast; and the Chicago division of the Southern Indiana to the northwest, and the Southern Indiana to the southeast; the E. & T. H., running south; and the E. & I to the southeast. There are interurban lines to Indianapolis, Paris, Illinois, Clinton, Sullivan, Youngstown and other points.

There are in the county 723 miles of public roads, with about 250 miles improved. The improvement has practically all been done with gravel. During the past few years a little stone has been used. The average cost of the gravel roads per mile is about $1,415. The first improved roads were built in 1898. There are extensive deposits of sand and gravel in the Wabash valley. These deposits are inexhaustible and the supply is being utilized both by the railroads and in the construction of public roads. On the eastern side of the river is a big terrace, fully three miles wide and twenty-four miles long. The terrace is composed of sand and gravel to a depth of many feet. West Terre Haute is situated on a gravel terrace of about 400 acres extent. The Big Four Railroad Company has a pit of about 50 acres in the northwest quarter of Section 20, and the Vandalia has a pit of equal size. The gravel has been worked to a depth of 15 or 20 feet and large quantities have been pumped from below water level. The gravel is rather coarse, containing some pebbles up to five inches in diameter. There is also a considerable quantity of fine sand. In many other places throughout the county good road gravel occurs.

The main line of travel through Clay and Vigo counties is the old National Road, which forms Main street through Brazil and Wabash avenue in Terre Haute. The proposition for a national road first took practical shape in 1806, when an act passed Congress authorizing the appointment of three commissioners to lay out a road from Cumberland, at the head waters of the Potomac in Maryland, to the State of Ohio. This was the beginning of the old Cumberland or National Road, the only highway of its kind ever wholly constructed by the Government of the United States, and a road of wonderful significance in the development of the West and the greatest and one of the most romantic highways of America. The existence of this road and the part it played in directing and distributing emigrants should be thoroughly understood and kept in mind when discussing the history of the counties through which it passed. The road was first opened to the public in 1818. In 1827, the National Road was completed through

Wayne County, Indiana. From Wayne County westward, the road passed through Henry, Hancock, Marion, Hendricks, Putnam, Clay and Vigo counties. The Government work on the road was done in Vigo County in the early thirties and was the means of bringing much capital and many workmen to Terre Haute.

General.—Vigo County, when enumerated in 1830, numbered 5,737; in twenty years it had increased in population to 16,500; another fifty years raised the number to 62,035, and in 1910 the total number of inhabitants was 87,930.

An early history of the county gives the following information concerning business in and prospects for Vigo County: "There are in Vigo County 12 grist mills, 18 sawmills, 40 large retail stores, 20 others with limited assortments, 3 printing offices." * * * "Coal is found in abundance and of a good quality." * * * "The enterprise of its citizens and other advantages possessed there, must, at no distant day, make Vigo one of the most important points in the West."

The area of the county is 402 square miles, with a farm area of 239,996 acres, of which 192,043 acres are improved. Land sells from $50 to $200 per acre.

Vigo ranks among the ten leading counties in yield of potatoes and tomatoes, also in raising watermelons and cantaloupes. It stands high in acreage of tobacco. It is among the most productive in cheese manufacture.

Wheat yields about 400,000 bushels each year, with an average from 14 to 16 bushels per acre, with some producing 25 to 30 bushels; corn produces about 1,300,500 bushels annually and averages about 25 bushels per acre; the average for oats is about 300,000 acres, yielding from 11 to 20 bushels per acre; rye averages 7 to 15 bushels and is grown on about 4,000 acres; timothy is given about 9,500 acres and averages from 1 to 1¾ tons per acre; alfalfa yields from a ton to three tons per acre and is grown on about 200 acres; prairie hay yields from one to one and a half tons per acre and has about the same acreage as alfalfa; clover yields about 9,000 tons, averaging from 1 1-3 to 1½ tons per acre. Potatoes receive about 300 acres and make from 70 to 80 bushels per acre; onions are raised to considerable extent, in 1909, 617 bushels were grown, and in 1908, 2,463 bushels, an average of from 7 to 55 bushels per acre; tobacco yields from 100 to 350 pounds per acre, but not many acres are given to the crop; tomatoes yield from 2½ to 9 tons per acre, and usually are planted on about 200 acres; berries of various kinds are raised, yielding from 10 to 30

bushels per acre and occupy from 15 to 25 acres annually. Horses, mules, cattle, hogs and sheep are grown to moderate extent for market.

In the early days it is said some cotton was grown. In a few places as much as ten acres was planted in the crop. Hemp was also grown, from which cordage was made for flatboats and other purposes. Flax was raised and made into linen. All kinds of fruits were cultivated and each farmer soon grew enough for his own use. Wild nuts were abundant—walnut, butternut, hickory, hazel and pecans. These were all a source of food. The growth of prairie grasses made winter feed plentiful for the stock.

PHYSIOGRAPHY AND GEOLOGY.

"Vigo County is a portion of a double slope. Its rocky strata incline westward toward the Mississippi and southward toward the Ohio, the westward slope being the more rapid. This circumstance seems to have had much to do in determing the topography of the county. The river flowing toward the south crosses the more rapid slope nearly at right angles. This dip of the strata westward probably causes the river to crowd its western bank, making it more abrupt than the eastern. The tributary streams flow easterly and westerly, with a trend toward the south, this trend being more pronounced in the western streams. The southerly dip of the rocks not only causes a southerly trend in the direction of the streams, but it causes them to crowd their southern banks, making them more abrupt than the northern. In general there are no streams flowing toward the north, the south branch of Honey Creek being the only stream of any size flowing in that direction. The greater portion of the surface of the county slopes toward the river, but portions of Riley and Pierson townships are in the valley of Eel River. The divide between the two rivers is a massive body of land lying in Linton and the western part of Pierson townships, and trending northeasterly through Riley Township. The N. E. ¼ of Sec. 18, 670 feet, and Sec. 20, 660 feet, of Pierson Township are the highest points in the county. Sec. 1 of Linton Township, and Sec. 6 of Pierson, and portions of Riley have an elevation of from 640 to 650 feet, which is about the same as the higher portions of Fayette, Nevins and Lost Creek townships. While the strata in general dip to the west, there are some local exceptions or irregularities. In Sec. 1, Linton Township, there is a sharp dip to the east, and another in Riley Township, with some evi-

dences of another in Pierson, but the evidence is not sufficient to determine whether the divide is an anticline or not. This divide is a rocky mass with just a thin veneering of bowlder clay and soil, and must have divided these valleys in preglacial times.

"The most marked feature in the topography of the county is the immediate valley of the river. It is from five to six miles wide and extends through the whole length of the county, but as the river forms the western boundary of the southern third of the county, only that portion of the valley on the east of the river belongs to Vigo County. This valley is an old channel that has been partly filled with sand and gravel. The numerous wells drilled in Terre Haute and vicinity shows the rock bed of this old channel to be from 120 to 150 feet below the general level of Terre Haute. The high land just east of the river, in the north part of the county, was part of an island in the ancient river. The channel east of the island is now occupied by Raccoon Creek of Parke County. This eastern channel of the old river accounts for the sudden widening of the valley just south of the county line. In Prairie Creek Township there is another island. The narrow channel east of the island is now occupied by Prairie Creek. The valley of the river turns abruptly towards the west above the island and is somewhat narrow below. The main channel of the old stream was along the west bank. The rocky banks, the islands, the main channel, the secondary channels and shallow places are so well defined that we can almost see the old river, whose waters carved out such a broad, deep trough through our county. The river and its flood plain occupies the western one-third of the valley. The river washes the western bluff at Durkey's Ferry and its flood waters wash them at various places. The greater portion of the flood plain is from 14 to 18 feet above low water in the river, and scattered over them there are many ponds and sluggish streams, indicating a very uneven surface. Between the flood plain and the bluffs there are fragments of a low terrace, which is sometimes of gravel and sometimes of rock. The eastern two-thirds of the valley is occupied by a massive gravel terrace, which has a somewhat irregular surface.

"The thickness of the bowlder clay in Vigo County is from nothing up to 150 feet. The thicker beds are probably in older channels. Frank Leverett, who has given the matter much attention, says that the average thickness of this portion of Indiana is about 25 feet.

"In coal mines abundant evidence is found of much more extensive erosion than appears upon the surface. The Union Mine, at Fontanet, is about 110 feet deep, through hard pan 55 feet, and rock 55 feet. But within 150 yards of the shaft the rock has been cut away and the bowlder clay rests on the coal; while a few yards farther, in the same direction, the coal has disappeared, the rock and coal both being cut out by erosion and afterward replaced by sand, gravel and bowlder clay. It is a common thing for the miner along Otter Creek or Raccoon Creek, and in other localities, to find the coal that is less than 125 feet below the plateau surface cut out by sand bars, gravel beds or bowlder clay. So common and extensive are these old channels, that Mr. Talley, of the Coal Bluff Mining Company, tells me they never buy 40 acres of coal land without drilling at least four prospect holes in order to make sure they are buying coal and not simply bowlder clay. Near Fontanet one drill hole penetrated bowlder clay 120 feet. At St. Mary's it is 100 feet to bed rock, and at Sandford it is about 150 feet. A little beyond it is 180 feet to shale, while the rock comes near the surface within a short distance of each of these localities. The south part of the county would probably yield similar testimony if it were tested with a drill. These facts indicate extensive local erosion prior to the glacial period, and, I think, indicate that the proportion between the main river and its local tributaries was formerly much the same as at present. These channels vary in depth. The river wells reach bed rock about 80 feet below low water in the river, or about 365 feet above tide, while the plateau in many places is over 600 feet above tide. Wells in other parts of Terre Haute reached shale at about the same distance below the river, so that we are sure that a considerable portion of the main valley was formerly 225 feet or more below the general surface of the uplands. The tributary channels are probably much shallower than the main valley, but little is known of them beside an occational well. Drift materials are known to be of considerable thickness in the valleys of Sugar Creek and of Otter Creek. The beds of the present streams are from 60 to 80 feet below the general surface of the uplands, and the bed of the old channel is at least as much as 60 feet to 80 feet lower still. The walls of these old channels, where exposed, are often quite abrupt, so that the county in all the myriads of years had not been base-leveled. It is evident that a vast amount of material has been removed from Vigo County by erosion, but when we consider the length of time, the amount

does not seem to be relatively great, and it seems probable that for much of the time this region was near the level of the sea, so that the action of eroding agents was weak and ineffectual."

After describing the formation and advance of the ice sheet, and the spreading out of the bowlder clay on its retreat, he says: "This material filled up the old drainage channels, so that the surface was a plain of gently undulating surface.

"But the floods from the retreating ice soon began to form drainage channels, sometimes reopening old channels in general, but occasionally cutting off some bend, giving rise to many curious features in the streams of glaciated areas. The retreating ice for a long time made a dam across the Maumee valley, so that a lake was formed. The surplus waters of this Maumee lake were discharged across the divide near Ft. Wayne into the Wabash valley, and through it to the gulf. This extra supply of water seems to have cleared the old valley of bowlder clay, at least in this region. While the new drainage channels were being opened, the surface of the bowlder clay weathered into soil, and became covered with vegetation. The remains of this vegetation, partially decayed, mingled with the clay, forming a black soil. Similar soils are formed at the present time on poorly-drained tracts in the northern latitudes. This old soil occurs in the eastern and southern parts of the county, under several feet of material deposited at a later period.

"Above this old soil there is a deposit of loess. 'Loess is a fine-grained, yellowish silt or loam, which overspreads the southern portion of the glacial drift of North America. It consists principally of quartz grains, but it usually contains a variety of such other minerals as occur in the drift. It is apparently derived from the drift, either by the action of water or of the wind. It often contains calcareous matter, which partially cements it. Sometimes irregular nodules of lime and of iron and of manganese oxide are found in this material. It also often contains fossil shells of land and fresh water mollusks, and occasionally remains of insects and bones of mammals. It has a strong tendency to vertical cleavage, and usually presents nearly perpendicular banks on the borders of streams which erode it.' It occurs at several places along the bluffs east of the river, and probably west of the river as well, but I have not noticed it there. There is a thick deposit in the bluff on the Bloomington Road; in the bluff just south of Otter Creek and in the bluff at Atherton on the north line of the county. Over this loess there is, in southern Indiana, a continuous layer of pale

silt called 'white clay,' which is the surface soil over much of the uplands of Vigo County.

"Later, a second ice sheet overspread the country, reaching as far south as the northwestern part of our county, including Sandford. When the ice sheet halts for some time accumulations of gravels, sands and clays are formed by the materials dropped by the melting ice. Such accumulations are called moraines. Sometimes a continuous ridge of considerable extent occurs, but more generally the moraine consists of low, rounded hills. The hills east and northeast of Sandford are parts of the Shelbyville or Wisconsin moraine that marks the southern boundary or limit of a second ice-sheet. The moraine extends northeasterly across the river into Parke County, being well marked to the north of Atherton. In the northwestern part of Fayette Township the white clay has been covered by a deposit of darker material brought down and deposited by this later ice.

"At several places in bluffs of bowlder clay I have found old wood from 20 to 45 feet below the surface. Sometimes this old wood was fragile, soon crumbling on exposure to the air; in other cases it was in good condition, and is still firm after being exposed to the air for a year. Wood has been found in digging wells in different parts of the county, so that old wood is quite common in the bowlder clay of Vigo County. The specimens found were of cone-bearing trees, probably some kind of cedar. One specimen showed over thirty rings of growth in a quarter of an inch. One ring was composed of only two layers or rows of ducts. These narrow rings of growth seem to indicate that there had been more *winter than summer* in the life of that little tree or shrub.

"The glacier accounts, in a general way, for the soils and drift materials of the uplands, but the soils and other materials in the valleys need explanation. The old channel of the river was swept of bowlder clay, probably by water from outside its ordinary watershed. After a time the ice melted out of the Maumee Valley, and the waters of Maumee Lake found a new outlet. The Wabash, diminishing in power, began silting up its bed with sand and gravel. This process continued until, in Vigo County, there was deposited a bed of gravel 20 miles long and four to five miles wide, and over 100 feet thick. This bed is of unknown extent toward the north and south. The great masses of gravel at Lafayette, and at intervening points, are, perhaps, parts of the same great bed. How can it be accounted for? In the record of some of the deep wells,

the upper portion of the drift materials is shown to be coarse, while the lower is of smaller size. This, if a fact, suggests delta formation. One who studies the gravel pit will feel sure that the sands, gravels and bowlders were arranged by water, but under what circumstances could the water get these rocky fragments of varying sizes together? A study of the upper portions, as seen in the gravel pits, suggests stream action, and possibly the whole mass was a delta formation whose upper portions were rearranged by stream action. Of something over 600 gravel stones examined, about 35 per cent. were limestones; the remainder were fragments of different kinds of granite rocks. The fragments vary in size from fine sand up to stones six inches in diameter, with occasional large bowlders. The surface features, at least, seem the work of a strong stream. The ridge, just west of Seventeenth street, which extends southward east of the old canal, seems to be an old sandbar. The ridge along Fifth street, which terminates in Strawberry Hill, is apparently another old sandbar. This mass of sand and gravel in the main stream must have dammed up some of the tributary streams, forming long, narrow lakes.

"Later, the river seems to have become narrower and more rapid, possibly on account of elevation of the northern portions of the continent, so that the western one-third of the valley was cut down some 20 feet or more, leaving the eastern two-thirds as a gravel terrace. The margin of the terrace has a direct course a little west of south from three miles north of the county line in Sec. 13-14-9 to Sec. 5-11-9, Honey Creek Township, where it turns to the southwest.

"Sometime after this the energy of the river seems to have been concentrated upon narrower limits, and a channel was cut deeper into the gravel, leaving a narrow fringe of second terrace or second bottom along the western bluff, which as about 30 feet above low water in the present river, while the main terrace rises from 40 to 70 feet above the low water. Then the river ceased to erode the gravel, and even when in flood it can only work over the materials of its own floodplain. As one watches the river when in flood, with its deep, strong current, and finds it unable to erode the gravel, he cannot help wondering as to what manner of a stream it was that cut out that great mass of gravel and carried it to unknown distances below. The river flows along or near the western bluffs, and its tributary streams flow along the southern bluffs. This is universal. There is hardly a rock cliff or bank of bowlder clay that does not face toward the north or toward the east. I can think of

only two or three exceptions along the narrow parts of Coal Creek valley. This is perhaps due to the fact that the strata generally dip toward the south and west. It is possible that the main current of the stream that deposited the gravel was on the west, and that the gravel was not as deep on the west. If true, the later streams had less work to do than we have ascribed to them. The lands of Vigo County were surveyed in 1815 and 1816. The meander of the river made at that time was not carefully done and the records are incomplete, so that no very definite conclusions can be reached as to the amount of change made in the course of the river since that time. But it seems certain that in no instance since that date has the river been able to erode the gravel. Those portions of its channel, where at least a fringe of timber has been left along the river, have not materially changed. But on the curves, where the timber has been cut away, the erosion has been extensive, so that the bed of the river has moved from 600 to 800 feet as at the bends in S. E. Sec. 8, and S. W. Sec. 16-12-9, and in S. W. 32-12-9, Harrison Township.

"The main terrace descends gradually towards the south from the north part of Honey Creek Township to the northern part of Prairie Creek Township, where it becomes the flood plain. Whether the terrace formerly extended farther south and has been cut down by erosion to its present extent and form, or whether it never extended any farther than at present, and has the original termination modified only by ordinary atmospheric influences, are questions which I can not solve. I am inclined to the opinion that the high terrace never extended much beyond its present position.

"Just above Clinton, Vermillion County, about five miles north of our county line on the west side of the river, a section of the high terrace terminates quite abruptly. It rises about 60 feet above low water, while the second terrace on which Clinton stands rises from 35 to 40 feet above the same level. The river valley is narrow, only about two miles wide in this locality. The high terrace appears again about two miles below, but on the east side of the river, and in full force just below the narrow place in the valley. The high terrace does not seem to have been formed in the narrow portion of the channel. Many streams flowing into the main valley are lost in the sands and gravel. In time some of them brought down clay enough from the hills to puddle large areas of sand, making it impervious to water, and marshes, swamps and wet prairies were formed. Fort Harrison Prairie, which extended through nearly the whole length of the county was largely wet

prairie that had its origin in obstructed drainage. The Macksville terrace across from Terre Haute is a typical gravel terrace, but much of the second bottoms is really a rocky shelf. Near the I. & St. L. R. R., it is a shelf of shale above Coal "N" (VII). South of Sugar Creek, for some distance, it is a shelf of limestone. Other interesting features of the old valley might have been mentioned, but enough has been said to show that the channel of the ancient Wabash contains many interesting problems for the one who has time and opportunity for studying them.

"The tributary valleys differ widely from the main valley. In them the drainage was purely local, and it, at times, was not relatively as strong as in the main valley. The great floods from the retreating glacier soon ceased to influence the local streams, but continued for centuries to strengthen the river. Changes of level that would materially affect the character of the main stream might have little effect on the tributary. The bowlder clay was all removed from the main channel in a comparatively short time, while the tributaries are still, after thousands of years, working on the bowlder clay with which the glaciers long ago filled their channels.

"In general, the tributaries seem to have cut downward as rapidly as the river, but could not open their channels to the full width as did the river. When the river silted up its channel with sands and gravel, they filled theirs mainly with sand, the local streams not being able to move as coarse material as the river. In some instances, at least, the main stream filled its channel so rapidly as to shut off the tributary stream, making it a pond or lake. In one of the branch valleys of Sugar Creek, on the N. W.$\frac{1}{4}$, S. E. $\frac{1}{4}$, Sec. 22-12-10, there is a deposit of very fine laminated clay, with occasional partings of fine sand, the whole resting in a trough of bowlder clay. Where this deposit outcrops on the main creek it is from 12 to 15 feet in thickness, becoming thinner as it extends back from the creek. In some places it has the appearance of shale, but to the touch it is fine clay. I found some similar material about a quarter of a mile down the creek, which seems to indicate that the deposit was formerly more extensive, but had been carried away by erosion. I once saw an extensive deposit of similar material in Sullivan County, northeast of Merom.

"The deposit is an interesting one, and indicates that this valley was occupied by quiet water for centuries, and that then the barriers were removed, the lake flowed away and the obstructed drainage system was reopened. The valley of Suger Creek, in Secs. 16, 22 and 23, is wider than below, and the same thing seems to be

true of East Little Sugar Creek, in Secs. 12 and 13. None of the other valleys have a similar form. The flood plain of the tributary streams is of different material from that of the main stream. It is more local in its character—sometimes clayey and impervious, again sandy or loamy. In many cases the smaller streams carry away valuable materials from their flood plains, while in general the river leaves its flood plain covered with a coating of rich, fertilizing sediments."*

The following sections will show the thickness of the surface material and the character of the geological formations in various parts of the county:

Section on Otter Creek, in N. W. Quarter of N. W. Quarter of Section 30 Township 13 N., Range 7 W.

	Feet.	Inches.
Soil, etc.	28	0
Gray to drab shale	20	0
Dark blue shale	1	0
Hard, blue, calcareous shale	0	2
Dark blue shale	5	0
Black, bituminous, sheety shale	2	0
Coal and shale partings	1	4
Gray fire clay	2	0
Hard gray to brown calcareous sandstone	1	0
Gray shaly sandstone	1	6
Gray to brown, hard micaceous sandstone	0	6
Gray, shaly sandstone	3	0
Gray sandstone with carbonaceous partings	1	6
Blue shale	4	0
Coal with partings	6	0
Total	77	0

Section of Bore at Coal Bluff, N. W. Quarter of N. W. Quarter, Sec. 12.

	Feet.	Inches.
Surface	10	0
Sand or gravel	77	0
Bowlder clay	22	0
Fire clay	3	0
Black shale	6	6
Coal	2	6
Very dark fire clay	2	0
Total	123	0

* Dr. J. T. Scovell, Ind. St. Geol. Report for 1898, pp. 684-693.

General Connected Section Along Sugar Creek, West of Wabash River, by Dr. J. T. Scovell.

	Feet.	Inches.
Surface, soil and clay	1	0
Subsoil, yellow clay	4+	0
Bowlder clay	10+	0
Shale	5+	0
Coal	1	4
Fire clay and shale	3	0
Limestone, crystalline fossiliferous	2	0
Shale, light colored to red	6–12	0
Limestone, impure, flinty	1	0
Sandstone, massive	11	0
Sandstone, merging into shale	14	0
Shale, bluish with ironstones in upper part	28	6
Bone coal and sheety shale	1	0
Coal	4	8
Fire clay	10	0
Total	108	6

Section at Sandford Hill, Along Russel's Run, Section 1. By Dr. J. T. Scovell.

	Feet.	Inches.
Soil, white and yellow clay	8	0
Bowlder clay	2	0
Sandstone, reddish and shaly	10	0
Shale, light colored	5	0
Sandstone, shaly	5	0
Sandstone, compact	9	0
Shales, light bluish, many fossils	17	0
Coal	3	3
Fire clay and shale	3	0+

Drainage.—"The Wabash River flows in a southwestern direction, through the northern part of the county, and from a point about nine miles southwest of Terre Haute it forms the western boundary. The immediate valley of the river in Vigo County is from four to five miles wide, occupying about one-fourth of the area of the county. The river at the ordinary stage of water has an average width of about 600 feet. Low water at Terre Haute near the middle of Township 12 North, is about 445 feet above sea level. The river and its flood plains occupy the western third of the valley, the eastern portion being a broad terrace. The flood plain of first bottoms rise from 14 to 20 feet above low water in the river, while limited areas of second bottoms rise from 10 to 15 feet, above the flood plain. The terrace rises from 50 to 75 feet

above low water in the river, but toward the south and Prairie Creek Township it merges into the flood plain. The highlands on either side of the valley have an elevation of from 100 to 200 feet above the river, the bluffs in some cases being quite abrupt. The greater part of the county is drained by the Wabash and its tributaries. The principal streams from the west are Brouiletts Creek, Coal Creek, Sugar Creek with several large branches, Clear Creek and Hawk Creek. These streams rise in Illinois and flow southeasterly into the river through valleys from one-quarter to one-half mile wide and 30 to 80 feet in depth. The streams from the east are Otter Creek, Lost Creek, Honey Creek, Prairie Creek, Turmans Creek and Busseron Creek. Portions of Pierson and Riley townships are drained by Splunge Creek and Eel River. The valleys of the river and its tributaries seem to be channels of an earlier drainage system that have been partly filled with sand and gravel so that in many cases the beds of the present streams are from 25 to 100 feet above the rocky beds of the older channels. These streams are for much of the summer 'lost creeks,' a fairly good stream among the hills disappearing in the sands and gravels of the main valley.

"The rocks of the county as seen in the bluffs and beds of the streams and as revealed in ordinary wells and mines are the sandstones, shales, limestones and coals of the Carboniferous Age.

"The soils are in general of glacial origin. In the valleys there are alluvial sands and clays and wide areas of black prairie soil, resting on a subsoil of sand or gravel. On the uplands the top soil is usually a fine white clay, resting on a subsoil of yellow clay which passes gradually into bowlder clay or hardpan which lies upon the bed rock. Along the eastern margin of the main valley there are extensive areas of dune sand, and at some localities on the eastern bluff there are thick beds of loess."*

"The large drainage basin of the Wabash River, with an area of about 23,000 square miles, extends from western Ohio embracing on the west side of its watershed considerable portions of southeastern Illinois. About one-half of this drainage area was covered by the Illinoian glacial lobe and many important changes have resulted from its occupancy of the region. Indeed, there appears to be very little similarity of outline between the present watershed and the watershed which in preglacial times had a discharge through the lower course of the Wabash. The westward flowing portion of the Wabash, with its several tributaries, traverses a dis-

*Dr. J. T. Scovell, Ind. St. Geol. Report for 1896, p. 507-508.

trict lying mainly outside the limits of the Illinoian lobe and appears to be entirely independent of pre-glacial drainage lines, for the drift deposits have been built up to a level above the pre-glacial rock divides. The head water portion of White and East White rivers, which are the principal tributaries of the Wabash, seem also to be very largely independent of glacial lines. There remains only the lower courses of the Wabash, and of tributaries entering below the great bend near Covington, Indiana, which are governed to any considerable extent by the pre-glacial lines of drainage. These all fall within the limits of the Illinoian lobe, or of unglaciated districts immediately outside.

"The Wabash River enters a pre-glacial valley just above the city of Lafayette, which probably furnished a line of discharge for a considerable territory on the north and west. The river, however, remains in this pre-glacial valley for only a few miles. It soon turns southwestward across a rock point, while the pre-glacial valley apparently takes a longer route to the west and south, coming to the river at its great bend near Covington. From Covington southward, the stream follows nearly the line of the pre-glacial valley to its mouth, though in a few places it cuts off rock points which projected into the pre-glacial valley.

"Above Terre Haute, this pre-glacial valley has been opened only a part of its width by the present stream, yet it shows a breadth of two to four miles. Below Terre Haute, the bottoms of the present stream extend from bluff to bluff of the pre-glacial valley. The breadth increases from about five miles at Terre Haute to fully 15 miles near the junction of the Wabash with the Ohio.

"Few data have been obtained concerning the elevation of the rock bottom, but these uniformly indicate a level considerably below that of the present stream. So far as collected they do not show descent in passing from north to south, but they are scarcely sufficient to prove a warping of the valley floor. A boring in the abandoned channel west of Lafeyette enters rock at a remarkably low altitude, of about 300 feet above tide, while at Terre Haute several borings made in the middle part of the valley enter rock at 345 to 360 feet above tide. Between these two points, borings at Clinton and Montezuma enter rock at an elevation slightly higher than at Terre Haute. The elevation of the rock floor of Shawneetown, Illinois, just below the mouth of the Wabash, is shown by an oil boring to be about 245 feet above tide. As this boring was made near the border of the valley, the rock floor may there reach a still lower elevation."

The valley occupied by the Wabash River has not had a uniform development from source to mouth. In the upper part, from the source to Huntington, the valley has been formed chiefly by the present stream, and is a shallow and narrow trench. At Huntington the river enters the old outlet of Lake Maumee, a glacial lake that occupied part of the basin of Lake Erie. This outlet has a valley several times as large as that occupied by the Wabash above this point. It opened a new or post-glacial line of drainage in its westward course across Indiana, except for a few miles in the vicinity of Lafayette, where it crosses or follows a pre-glacial valley for a few miles. It has been compelled to do considerable excavation in rock from Huntington down as far as Covington and still carries rapids at several points. Below Covington, the stream follows very nearly the lines of a partially filled pre-glacial valley, and its work has been largely the removal of a portion of the glacial deposits left in that valley. However, it makes some deflections into the edge of the upland, cutting off points of the bluff. At such places, the channel is occasionally in process of excavating rock. The cause for these deflections is not in all cases clear, but it is probable that in the majority of the cases the filling was such that the stream was free to pass across these points and thus take a more direct course than that of the old ones around them. In some cases it is possible that the ice-sheet may have had an influence in guiding the stream across projecting points beneath it or on its border.

"The length of the valley occupied by the Wabash is about 450 miles; but the length of the stream is much greater, for the river in its lower course makes several ox-bow curves within the valley. The source of the valley is about 1,000 feet above tide, while its mouth at low water is about 311 feet. The average fall, if we estimate the stream to have a length of 500 miles, is therefore about 16½ inches per mile. The rate of descent is far from uniform, being much more rapid in the upper portion than in the lower. There are also many rapids separated by pools or sluggish portions of the stream. The elevation of the stream has been determined at many points, but in the absence of a careful measurement of its length, the rate of fall is only approximately known. The portion of the river above the point where it enters the old lake outlet, estimated to have a length of 100 miles, has a fall of about 300 feet, or three feet per mile. Railway levels and canal surveys at the point where the river joins the old lake outlet shows its elevation to be nearly 700 feet above tide, the altitudes reported

varying between 696 to 699 feet. The canal survey below Huntington shows a fall of 32 feet to the mouth of the Salamonie, a distance of about 15 miles, and a fall of 34 feet between the mouth of the Salamonie and the mouth of the Mississinewa, a distance of perhaps 20 miles. In the next 20 miles to Logansport, there is a fall of 50 feet. From Logansport to Lafayette, a distance of about 50 miles, there is a fall of 77 feet; from Lafayette to Attica, a distance of 25 miles, the fall is but 19 feet, and from Attica to Covington, a distance of 20 miles, but 17 feet. From Covington to Terre Haute, a distance of 55 miles, there is a fall of only 22 feet, this being the lowest gradient for so long a section on the river. From Terre Haute to the mouth of White River, an accurate survey by the United States Army Engineers shows a fall of 71.18 feet in a distance of 122.55 miles, or about 8 inches per mile. In this distance there are 13 riffles, each but a fraction of a mile in length, which have a combined fall of 17.86 feet. These reduce the fall of the 120 miles not embraced in the riffles to 53.32 feet, or about 5.33 inches per mile. The greatest fall at a riffle in this section of the Wabash is at Grand Rapids, just above the mouth of White River, where it amounts to 4½ feet. The fall from the mouth of the White River is 65 feet in a distance of perhaps 90 miles by the windings of the streams."*

"Otter Creek, rising by several branches, generally in Clay County, drains a large and interesting area of country, including the greater part of Nevins Township, and the southern portion of Otter Creek Township. The two main branches unite near the western boundary of Nevins Township. The valleys of these streams are from one-eighth to one-fourth of a mile wide, the stream usually nearer the southern bluff, which is generally more abrupt and frequently rocky. The southern tier of sections in Nevins Township is drained by a third branch which enters the main stream in the southeast part of Otter Creek Township. The branches of these streams are not large nor numerous but the land along the streams is badly broken up. On the divide between the north branch and Raccoon Creek valley there are several sections of good farm land and some between the two branches, but fully one-half of the township is too broken for first class farm land.

"The extreme southeastern portion of Otter Creek Township is very broken; the heavy bluff south of the creek extending southward into Section 31; north of the creek there are some hills but

* Leverett, U. S. G. S. Monograph XXXVIII, pp. 528-30. U. S. G. S. Monograph XLI, pp. 187-89.

no regular bluffs. There is also some broken land in Sections 5, 6 and 7, but in general the surface of this township is well adapted to agricultural purposes.

"Lost Creek is a small stream that drains the central portion of Lost Creek Township, flowing through Harrison Township into the river. The valley is shallow and the banks are seldom abrupt. Some of the smaller branches of the Otter Creek are evidently young streams; but the main creeks seem to flow in old channels. The valley of Lost Creek seems to be of recent origin. The extreme northeastern portion of Lost Creek Township is drained by a branch of Otter Creek and a few branches in the southeast are drained by branches of Honey Creek, while a portion of the southwest is drained by Church's Run. Sections 1, 2, 11, 12, 34 and 35 contain about all the broken land in this township. Some sections, as 22, 23, 27 and 28, are nearly level, seeming to have about the same surface that was left by the glacier, as the drainage channels have not penetrated them to any extent.

"Honey Creek rises in Clay County, flows through the northwestern portion of Riley Township. It is about the size of Otter Creek, but has a much longer course in the county than any other creek. It drains the north and west of Riley Township. In its southwesterly course to Section 10 in Riley Township, the valley is somewhat symmetrical, but in its westward course the south bank is much more abrupt and extensive as it continues into Section 21 of Honey Creek Township, while the north bluff stops in Section 13 and is not strong there. It has several branches from the east and southeast, but the largest is the south branch, which drains parts of Pierson and Lenton Townships, being the north side of the highest elevation of the county. The valley of this branch and its tributaries are deep but somewhat irregular, perhaps more bluffy on the west, but not much difference. The southeast portion of Riley Township lies in the valley of Eel River and is drained by Splunge Creek. The surface of this township along Honey Creek is much broken, but the greater portion of the township has a good surface.

"Sugar Creek is the largest in the townships, and topographically is perhaps the most interesting. Big Sugar Creek runs from west to east across the center of the township. It is a strong stream having a course of 20 or 25 miles in Illinois before entering the county. In Vigo County it is from 70 to 100 feet deep and from one-half to three-fourths of a mile wide. The creek in general is near the south bank, which is more abrupt than the one on the north. In Section 23-12-10, the creek cuts through the limestone

above Coal 'N.' At this point the rock channel is not more than 30 rods wide, while the valley proper is as wide as ever. In northeast quarter section 25, where it joins the main valley, the rocky walls of this valley are not more than 40 rods apart. Above Section 23 the walls of the channel in this county are mainly of bowlder clay. Sugar Creek receives only two or three small streams from the south, but has two large branches from the north. West Little Sugar Creek, which rising in Illinois, enters at the southwest corner of the township and from a little east of south joins the main stream in the east part of Section 22-12-10, and East Little Sugar Creek, which rises in Fayette Township, near Coal Creek and flowing southerly, enters the big creek in the west one-half of Section 30-12-9. A branch of this creek rises in Section 34, Fayette Township, and flowing a little east of south enters the east branch in Section 24-12-10, so that the northern portion of the township is drained by three nearly parallel streams, each of which has a narrow deep valley. Each of these streams show some rocks in its bank or bed, but in general their channels are of bowlder clay. The narrow channels of the main stream and of the east branch in their lower course suggest the idea that these streams may flow in recent or post-glacial channels in the lower portion of the course. The rocky strata dips toward the west, but the surface inclines towards the east and the thick beds of bowlder clay towards the west may have changed the drainage area somewhat, so that a much larger territory is tributary to the present Wabash than to the ancient stream. Clear Creek, rising in Illinois, enters the county in the south part of Section 28-12-10, and flowing southeasterly joins the river in Section 11-11-10. Its valley is as deep as that of Sugar Creek, but not as wide. Its channel is also rocky and narrow in its lower course. The extreme southern portion of the township is drained by two streams that rise in Sections 3 and 4-11-10 and running in nearly parallel courses, flow into Hawk Creek, which flowing through Section 16 reaches the river near the center of Section 22-11-10. The surface of the township is very much broken, more so than that of any other township. The long river bluffs and the bluffs of the two streams that cross the township and the bluffs along Three Streams that drain the northern portion occupy fully 75 per cent. of the area of the township. The rocks associated with coal N (VII) crop out along the river bluffs and to some extent in other places, but in general the bluffs are of bowlder clay, and one comes to think of the township as a mass of bowlder clay and other glacial debris, through which the surface

waters are digging channels as day by day they work at their task of carrying these materials down to the gulf. This task is only well begun. Wide areas on the divides are practically level, with no established drainage lines, showing little evidence of change since the retreat of the ice. The tributary streams with their deep narrow V-shaped channels are reaching up into these areas and rapidly curtailing their extent. One can find numerous instances of from 6 to 10 of these little streams heading up into one 20-acre tract. Similar features occur to some extent in Fayette Township, and east of the river also, but in no place are they as well marked as in Sugar Creek Township. These peculiar forms of relief give the region a new and unfinished appearance. The broken nature of the surface is well indicated by the direction of the roads of the township.

"Fayette Township is mainly drained by Coal Creek. A few little streams flow into Brouilets Creek and the river, and a few sections are drained by East Little Sugar Creek. Coal Creek rises in Illinois and the west part of the township and flows southeasterly into the river. Its channel is deep, narrow and rocky and its bluffs are abrupt. It seems to be a new or recent valley. The same is true of its branches and of two or three small streams that flow directly into the river.

"A few sections of Honey Creek Township lying south of the main stream and along the south branch are broken, but by far the greatest portion, about one-third, is upland; the balance is in the river valley. Some of the valley land is low and flat and has been drained with considerable difficulty.

"Prairieton is wholly in the main valley. Along the river there is considerable flood plain and several bayous, but in general the surface is good, though some parts are marshy or swampy.

"Prairie Creek rises by three branches in the north half of Lenton Township. These branches unite in Section 8 of Lenton Township, forming Prairie Creek. The branch of the old channel occupied by the main stream is about three-fourths of a mile wide, with some high bluffs and some low sandy hills. Prairie Creek and its branches drain the greater part of Prairie Creek Township. The valley of Prairie Creek, or the old channel east of the channel, occupies about four sections, so that more than one-half of the township is bottom land. There is some broken land along the bluffs, but it would not amount to more than three or four sections. The valleys of the streams are comparatively narrow and shallow and there is very little broken land."

SOILS.

The soils of the county have a large acreage of the two great divisions of soils—the uplands and the river bottoms. The soils are mainly of glacial origin. Native rocks have contributed considerable material to the soils, but the amount is very small compared with the amount which is the product of glacial action. These soils have been modified into many types by water and wind transportation and by the processes of weather. The bowlder clay is weathered into the yellow, silty clay, which is the principal subsoil of the uplands. Practically all of the upland type was originally covered with a dense forest growth, and a large amount of vegetable matter intermingled with the soil has made the area a very fertile one.

On the slopes in many places the surface has been washed away, exposing the yellow subsoil, giving the fields a spotted appearance. All of the staple crops are grown in the county, and in addition many special crops are grown on the various soils adapted to the needs of such crops.

The following table gives the names of the various soil types and the area occupied by each:

	Sq. Mi.
Knox silt loam	205
Wabash silt loam	70
Sioux sandy loam	61
Morainic area	20
Sandy clay loam	20
Knox sand	10
Mode silt loam	7
Wabash clay loam	5
Vigo black prairie	3
Wabash gravelly loam	1
Total	402

Knox Silt Loam.

The Knox Silt loam and the modified silt loam are the same as those described under the headings in the discussion of Clay County soils. The topography in general is level or gently undulating, except in limited tracts over the area. In the central western part of the county, west of the Wabash, occurs the most broken and rough land of this soil type.

These upland silt loam types are good, productive soils and many of the best improved farms in the county are found on these

soils. In a very large part of the area, however, through the mining region there are few good farm improvements, because the chief work of the people is mining, and the surface is neglected, only small fields and patches in cultivation. These soils are well adapted to all the staple crops, and truck farming and fruit growing have been carried on with good results.

Sioux Loam and Sandy Loam.

The eastern two-thirds of the Wabash River valley is occupied by a massive sand and gravel terrace. This area is from two to four miles in width and at least twenty-four miles in length. The surface is rather irregular, but there are no very marked differences in elevations and in many places the surface is very level for great distances. Through Otter Creek Township along the river, a terrace rises from 50 to 80 feet above low water and gradually slopes to the eastward. In Harrison Township it is 50 or less above low water, with low ridges and shallow valleys extending north and south, but has no slope toward the east. Through Honey Creek and Prairie townships the elevation of the terrace gradually diminishes until it merges with the flood plain in Prairie Creek Township. In the flat portion of the terrace are many parts in which the natural drainage is very poor, and before artificial drainage was begun, swamps, marshes and wet prairies occurred.

The soils of this terrace area vary considerably in character. Along the southern border it merges into the Knox sand. In the northern part along the north side of the tributary stream, it is built up into dune-like hills, also of the Knox sand type. The great expanse of the area grades through all phases from coarse sand and gravelly type to sandy loam and true loam types. The greater part of the area is composed of the two latter types.

In the sandy loam, the soil is from brown to black, coarse to medium sandy loam, from 10 to 24 inches deep and containing a considerable portion of organic matter. The color becomes lighter with depth. The subsoil at varying depths consists of almost pure water-worn gravel. Gravel is found at all depths, from a few inches to several feet, and is usually many feet in thickness. Extensive gravel pits have been opened in the terrace gravel and it affords an inexhaustable supply of good gravel for building public roads and for railroad ballast. In many places the subsoil is a mixture of gravel, sandy loam and silty sand, etc.

In the Sioux loam area the surface is usually level and the soil contains a smaller percentage of sand and a higher percentage of

silt and clay. It is free from pebbles of any size. The subsoil is of a loamy texture for a depth of 24 to 48 inches, where it begins to grade into the gravelly beds.

At the present time, drainage conditions are such as to insure good results. In places where the gravel comes nearer the surface, the soil is so open that the water passes through so readily that crops suffer from drought. This was especially noticeable on the crop of 1911, much of the crop being entirely destroyed, and in other parts the lower corn blades were badly fired. When the gravelly layers are two or more feet below the surface the moisture is better retained.

In many places the depth of the material down to rock has been shown by wells. The wells are usually from 12 to 30 feet deep in the part of the area south of Terre Haute and reach the solid rock at such depth. North of Terre Haute the material has greater depth.

The land of the area is valued at $75 to $150 per acre. There is not much for sale at any price. North of Prairieton, the prices range from $150 to $300 per acre. This part is devoted very largely to truck farming and is called "Garden Town." A considerable area to the west of Middleton also raises considerable truck for the market. A great number of melons are grown, but not to as great an extent as a few years ago. The reason is said to be because other regions can produce melons at a lower cost. More cantaloupes are raised than formerly.

Corn yields from 40 to 85 bushels. This year it was badly burned before August 15th because of the long drought. Much had scarcely put out shoots, but in good seasons the best results are obtained on ground which is properly cared for. Wheat averages 20 bushels. Some pieces of clover sod made 30 bushels. The ground must be kept up by clovering. Wheat straw is not heavy. All straw is used on the farm for feed.

It is often difficult to get a good catch by clover, but it grows well when well started. Will yield from one to one and a half tons per acre. Very little is cut for seed, but when so used gives about one bushel per acre. Cowpeas have not been tried until the past two or three years, then only on very limited areas. They make good growth and a greater acreage will likely be grown. Timothy does not grow well and but very little attempt is made to secure the crop. Some pieces of land have been in corn and wheat almost continuously for fifty years, but the production is low on such tracts. A large acreage of this area should be devoted to truck

farming and the growing of small fruit. The market opportunities offered because of the nearness to Terre Haute should be an incentive for much of this kind of work.

The following table gives results of the mechanical analyses of these soils:

Description.	Fine Gravel, Per Cent.	Coarse Sand, Per Cent.	Medium Sand, Per Cent.	Fine Sand, Per Cent.	Very Fine Sand, Per Cent.	Silt, Per Cent.	Clay, Per Cent.
4 miles N. Prairieton Surface 12 in.....	3.0	10.0	8.2	28.5	10.5	25.4	13+
Grays Addition E. Terre Haute.....	2.2	10.5	11.4	30.0	12 0	20.0	14.5
3 miles S. E. Atherton.....	2.5	10.2	10.5	28.7	10.8	20.5	17.5

Wabash Silt Loam.

The soils included under this heading are those of the river flood plain. The soil varies from the Wabash silt loam to the Wabash clay and the Waverly clay. The area comprising the two types is chiefly north of Terre Haute. It consists of a heavy silt loam or clay loam, with an average depth of about 18 inches. The color varies from light to dark brown, according to the amount of organic matter present. The soil is quite sticky when wet. In poorly drained areas it has a tendency to bake and crack, and if plowed when too wet it forms large clods which are difficult to break. The clay content increases with depth except where the immediate subsoil is underlain with gravel deposits. The surface is about level, with a very gentle slope toward the stream. The natural drainage is not very good, and the entire area is subject to frequent overflows. The floods occur principally in late winter and early spring. If the ground gets in condition for planting before too late in the spring, the crop usually has a chance to mature without being destroyed by flood. The soil is renewed by the overflow and is very fertile. Corn is the chief crop grown and yields from 50 to 65 bushels per acre. Early frosts sometimes catch the late crops because of the good supply of moisture the crop is kept green and growing throughout a rather long period.

Waverly Gravelly Sandy Loam.

In connection with the soils of the river bottom and the low terraces are areas which become very gravelly. The type in general consists of a coarse, gravelly, sandy loam, varying in color from light to a reddish brown. The surface is usually covered by con-

siderable gravel. The majority of the pebbles are less than two inches in diameter. The gravel increases with depth. Corn is grown upon this type and in ordinary seasons produces well. In most cases there is enough sand, silt and clay with the gravel to admit of successful cultivation, but in some small areas the gravelly content is too high to allow profitable and easy cultivation.

The Morainic Area.

In the northwestern part of the county is an area to the east and north of Sandford which has received an accumulation of sand, gravel and clay from the material of the Wisconsin glacier. In part of the area, ridges of considerable extent occur, but in general the surface is of low, rounded hills. There are also areas of practically level surfaces. The "yellow" or "white" clay found as a surface over the uplands in the rest of the county are covered by material of more recent origin. In parts of the area the hills wash badly, as is evidenced by the erosion channels to the north of New Goshen, and extending over to the river bluff.

The following lines are summarized from the work of Mr. Leverett, in U. S. G. S. Monograph No. XXXVIII.

Along the Wabash River valley extensive gravel terraces occur, both above and below the points where the ridges of the morainic system cross (the Champaign). Possibly a portion of the gravel connects with this morainic system, but by far the larger part connects with moraines of later date which cross farther up the valley. East of the Wabash in Parke County, wells along the outer or main belt and on the plain north of it are seldom more than 30 feet in depth. They pass through about 13 feet of yellow till, while others enter gravel. These beds of sand or gravel are often found associated with the yellow as well as the blue till. In the vicinity of the Wabash valley, the Shelbyville drift sheet is found to be generally coated with a yellowish loess like silt, to a depth of several feet. This is especially well shown on the west side of the valley in the vicinity of St. Marys to the northwest of Terre Haute. This silt is better developed on the borders of the river than at points a few miles back, there being scarcely enough silt in the latter situation to conceal the bowlders which cap the till. The distribution of the silt seems to be such as would be expected from the drainage conditions, which were inadequate to carry off the water from the melting ice. There are, however, other features which seem to indicate good drainage conditions. At the point where the moraine

crosses the river, near Atherton, a gravel plain is built up to a height of about 75 feet.

In going over this area in the northwestern part of the county, no attempt was made to map separately areas of sand, silt and clay. On the western side are small areas extending as arms from the black prairies of eastern Illinois. These black soil areas were in part mapped and are described in the following paragraph. About fifteen samples of soil were taken over the morainic area. The results of mechanical analyses are given in the general table. In the area immediately surrounding New Goshen, the surface is very level. The soil is a light yellow, rather compact, not of as loose texture as the typical upland soils of the southern and eastern parts of the county. The subsoil becomes gravelly. Improvements are from fair to good. To the east the land becomes more gravelly and sandy, and this part of the area is devoted chiefly to pasture. In the area two to four miles to the north, surface becomes rather rough and is eroded considerably.

In the better parts of the morainic area the land is valued at $80 to $150. Corn yields from 60 to 75 bushels; wheat 10 to 20 bushels. Not so much wheat is grown as formerly, more attention being given to oats. Clover and timothy are both grown for hay. Considerable sorghum is usually grown, but crop is small this season.

The native timber growth consists of white, black, chestnut and burr oaks, shell bark and pig nut hickory, sycamore, sour gum, elm and black walnut.

Wabash Clay Loam.

In the southeastern portion of the county is the low land region of the Splunge Creek valley. The area has the appearance of an old lake bottom. The soil is a light to yellowish-white clay. There are several square miles of this soil. It was formerly covered with a heavy growth of prairie grass.

The drainage of this area is at present receiving much attention. In the margins of the area much of the land is uncultivated, but in the part next to the stream and lying adjoining Clay County a large part is never under cultivation, and during wet seasons the uncultivated area is much increased. This area is fully discussed under the discussion of Wabash Clay loam in the Clay County report.

SUMMARY.

On the terrace soils, in the vicinity of Terre Haute, truck farming is receiving much attention. The soils are the best for this purpose and the local demands for the products give a very profitable occupation.

The interurban lines have aided in the expansion of the area devoted to truck farming by affording a quick means of transportation. These lines have also been a great help in the dairying business.

The growing of tomatoes for their food value was begun in Terre Haute in 1830, at the time tomatoes were first cultivated for the purpose of making catsup, pickles, etc. Prior to this time, tomatoes were cultivated as curiosities only and were called "love apples."

Indiana stands second in the quantity of tomatoes canned. In Vigo County are large areas of soils well adapted to the growing of the crop and many parts not now yielding a profitable return would be made to produce well with this crop. The establishment of more canning factories should be encouraged.

In raising tomatoes for canning, the grower first of all seeks for a large yield. Early maturity is of less importance, since he contracts to sell the whole crop at a fixed price. This fact must be taken into consideration in selecting the varieties of tomatoes to be raised, the soil and the kind of fertilization. The usual practice is for the canneries to furnish the plants, so that the grower has only to deal with the selection of soil, the fertilization, the cultivation and harvesting of the crop.

Tomatoes will grow well on any soil which will yield good corn. For the earliest tomatoes grown for market purposes, the soil must be light and warm, but for the main late crop a heavier soil is better. The average growing season is from May 15th to September 15th. In very favorable seasons the growing weather may extend a month longer. Often the rainfall is low in July and August and the growth of the crop is checked. This may be guarded against by deep planting and careful cultivation, maintaining a layer of fine earth on the surface to serve as a mulch.

Lands which have had green crops turned under, or to which applications of barnyard manure have been applied, will have the water-holding capacity increased. Where barnyard manure is used on tomato land, it is advisable to apply it in the fall and work it well into the soil at that time.

While it is more difficult to cultivate tomatoes on heavier lands, it is the experience of catsup makers that on these lands a tomato of superior quality is produced, and the quantity of pulp increased. For the best yields, it is necessary to have heavy fertilizers. The price paid for the canning crop is relatively low, and the purpose is to produce good yields and the question of fertilization must be well considered.

The tomato plant requires an abundant supply of food. It has been established that ten tons of fruit with the accompanying vines would contain 57 pounds of nitrogen, 16 pounds of phosphoric acid and 94 pounds of potash. There is little danger that the soil be made too rich, but the cost and amount of fertilization must be adjusted to conditions. For heavy crops, an application of 500 to 1,000 pounds per acre should be given of a fertilizer containing nitrogen 4 per cent., actual potash 6 per cent., and available potash 7 per cent.

When an early ripening is desired for the market, the plants are tied to stakes and pruned to single stems, bearing from three to six clusters of fruit, but for canning or a late crop, a heavier yield is secured by allowing the plants to fall on the ground or rest on pieces of brush or wood.

Great care should be taken in the selection of seed corn. In the fall of 1911 corn did not properly mature, and it is very probable that much bad seed will be used in the spring of 1912. All seed should be tested by taking a few grains from the ear and germinating in some soil.

Many of the farmers complain about statistical reports being too high on grain production, but blame the farmers themselves for giving exaggerated information.

Several good catalpa plantings are found over the county. Most of the trees are from three to four years old, and where they have not been troubled with Catalpa Sphinx the trees have made a good growth.

In the region about Tecumseh some good vineyards have been grown. The vines are planted on the upland slopes on the west side of the river. The situation and soil seem well adapted to the growing of grapes, and good yields are obtained. In the winter of 1909 and 1910 many vines were partly killed by the icy freezes and it was necessary to cut them back to mere stubs to take a new start. Usually the vines are not injured by weather conditions. Many new vines have been put out during the past two years.